The

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# City Power Stations.

HAVING been led to expect so much from the national system of co-ordinated electricity generation, it is hardly astonishing that the public should be now asking itself why a large capital station is to be erected in the heart of London?

Opposition to the building of the London Power Co.'s station at Battersea, belated though it be, has been well organised, but we hope that after the Chiswick and Barton battles the present agitation will not be allowed to go far enough to involve further waste of public money without full consideration of the facts of the case. What would be the result of abandoning the Battersea site, which has been acquired and in respect of which contracts have already been entered into representing £1,500,000? A delay of at least two years in the station's completion, which implies the postponement of any possible reduction of the cost of energy consequent, not only on the necessity for its transmission from an outside source into the metropolis, but also on the inevitable delay in shutting down older and comparatively inefficient generating stations which the new plant would make possible. Moreover, the fact must not be overlooked that several years hence when the full complement of plant has been installed in the new station and it would be discharging the maximum amount of products of combustion into the atmosphere, it should by then have displaced more than the corresponding quantity of such fumes now emitted by domestic chimneys, private householders being by far the worst offenders in the aggregate in this respect. Because they do it by the million, their offence passes unnoticed, just as power stations have hitherto not called forth protests because of their scattered locations. All recent agitation has coincided with the building of large capital stations.

Apart, however, from such considerations, it is evident that exaggeration has been rife. When the London Power Co. obtained consent to build its station at Battersea, it assumed an obligation to avoid, so far as is reasonably possible, the committal of any nuisance. The prevention of the emission of grit and dust is no longer a problem of magnitude, being merely a question of expense and the choice of a system; little, if any, visible smoke emerges from modern power chimneys, but sulphur fumes are in a different category. The latter

problem is, however, being attacked vigorously in this country and elsewhere with results that promise well for the future. Indeed, fuels generally have received a deal of consideration lately, and two of them are compared elsewhere in this issue. We have been assured that a German concern has succeeded in producing oil from brown coal commercially, and it was recently announced by the I. G. Farben dye concern in Germany that negotiations carried on with the Standard Oil Co. of New Jersey, U.S.A., relative to the manufacture of synthetic oil had been successful, the results of experimental work on both sides having been such that it has been found possible to draw up a common programme for the general introduction of the new process.

Lignite is used as a fuel to a considerable extent in the electricity generating works established in the vicinity of Bitterfeld, Germany, which supply power not only to large chemical works, but also for transmission over the long distance to Berlin. From the use of lignite to that of lignite dust is but a step further, and this stage has been reached in the large Boehlen power station, where for the first time on a large scale lignite dust is being used for the operation of a big station. The conditions for this purpose were favourable in so far as the power station has been erected in conjunction with a modern lignite briquette works, so that the drying plant for both works could be built in common. Attention to this fact was drawn by Herr Zeuner, of Dresden, at the recent meeting of the German Lignite Industry Association held in Berlin. The author pointed out that the use of lignite dust for boiler-firing purposes permitted of the erection of the largest boilers. At present the station has a machine capacity of 169,500 kW, which will be increased to 209,500 kW by the autumn. Some of the boilers are fired with crude lignite in conjunction with an addition of dust, while others, including two of the largest boilers in Germany, burn dust solely. The production of the dust takes place in a central pulverising installation in which seven coal-dust mills of various types are arranged. All the apparatus for controlling the boilers is concentrated on a switch desk, and only one man is necessary to look after four boilers.

Thus is progress being made: hitherto attempts have been made to burn coal in the powdered state and other fuels under boilers designed to consume raw coal, but boilers are now being designed rationally for the new conditions, and when clean coal which has been suitably treated at the collieries becomes available at an economic price, we shall hear no more of the emission of grit, dust, and fumes from power-house chimneys. With regard to Battersea, we cannot help feeling that both the Electricity Commissioners and the London Power Co. must have given serious consideration to the whole problem, and that the public will be well advised to leave the matter in their hands.

**The British Industries Fair.**

We wish to direct the attention of electrical and allied exhibitors interested in future British Industries Fairs to the communication appearing in our "Correspondence" columns to-day from the pen of Mr. E. J. Jennings, honorary secretary of the Electrical Committee, to whom so much is owing for the success of past displays. We have not yet been over-impressed with the suggestions for a change of date, because the Government will take a good deal of convincing that there is an overwhelming majority view that the entire Fair, London and Birmingham, should be altered. The figures quoted from the electrical questionnaire of last year are mildly described as "inconclusive," but if we add to the number definitely favouring February/March those who did not even reply, and who therefore may be regarded as satisfied with a continuance of the present dates, it seems that the subject is hardly worth pursuing. It might be as well to recognise that the Fair as a whole without a good Electrical Section is now unthinkable; also that at May-June the I.M.E.A. Convention, with an increasingly important exhibition, in yearly changing localities, also other conventions, are occupying a great deal of attention. If the D.O.T. and the Birmingham Chamber of Commerce can ascertain from a majority of all classes of exhibitors that February or March is unsuitable, that no doubt will go far to settle the matter, but no sectional attitude can control the whole. The one outstanding thing at the moment is that the date has been definitely fixed for the 1930 show, and space has already been booked.

**Cooking Without Tears.**

The British Electrical Development Association is this month devoting its energies to the advocacy of electric cooking, and its activity is most opportune. Even the most enthusiastic devotee of the coal range cannot contemplate without apprehension the prospect of summer days spent in the stifling atmosphere of the kitchen, and this should assist in the electrical education of the housewife.

The periodical advertisements, which are now becoming quite a familiar feature, will put forward during the month several good reasons why cooking should be done electrically. As usual, attractive and compelling "lay-outs" for use in local newspapers are available at reasonable prices, and a special lecture and lantern slide have been prepared. Electrical dealers and others again have the choice of two window displays. One of these depicts an electrically-equipped kitchen with the cardboard figure of a lady operating a breakfast cooker. The other contains examples of large and small cookers and two electric kettles. Above the display is the "At a Touch of the Switch" sign which is appearing in all the Association's advertisements.

**The Home and Overseas Markets.**

In an article which appeared in the February *Journal* of the British Chamber of Commerce in the Argentine Republic mention is made of the sale of the "Atlas" undertakings in the Republic to American interests. It is argued, in effect, that although this will probably mean the diversion of orders for electrical plant to the United States, the British electrical industry will not suffer very much as the home market will keep it going. The Electrical Review is quoted for evidence that the industry is more favourably placed than most other British industries, and it is said that the scope for domestic progress is a "trump card" for the industry. While we will not deny that the potential business in the home market is very considerable, it will never be able to replace our export trade. It may be of interest to refer to statements made by the chairmen of two or three of the leading electrical manufacturing concerns. At the last annual meeting of the General Electric Co., Ltd., Sir Hugo Hirst stated that over 20 per cent. of the company's products was exported. At Henley's last meeting Sir George Sutton said that more than one-third of the total turnover was attributable to overseas buyers. In the course of his speech at last year's meeting of the Metropolitan-Vickers Co. Sir Philip Nash said "the British manufacturer (of large electrical plant) has to depend, in order to maintain an economic load in his factories, on obtaining at least 50 per cent. of it in the overseas market." It is clear, therefore, that the loss, or threatened loss, of any market cannot be looked upon with equanimity by British electrical manufacturers. On the contrary, every nerve has to be strained to retain and cultivate those markets in which we find business, while new outlets have ever to be sought.

It is true that there was a kind of proviso in the Atlas sale agreement that "for at least ten years, British manufacturers should be given preference for the bulk of the electrical equipment required, other things being equal," but the transaction, though eminently satisfactory to the Atlas shareholders, must eventually have an adverse effect upon our exports to Argentina.

# A Near-East Development.

**Notes on a visit to the hydro-electric works at present in the course of construction on the River Jordan in Palestine.**

By OUR SPECIAL CORRESPONDENT.

ABOUT five miles south of the Sea of Galilee on the Lake of Tiberias, the River Yarmuk joins the Jordan from the East. It is a rapid stream with numerous waterfalls and drops from sea level to 800 ft. below sea level in a distance of a few miles. The hydro-electric scheme makes use of the last of those falls, some 27 ft. high, and also of the drop in the River Jordan itself in the same neighbourhood.

Fig. 1.—The Yarmuk Dam.

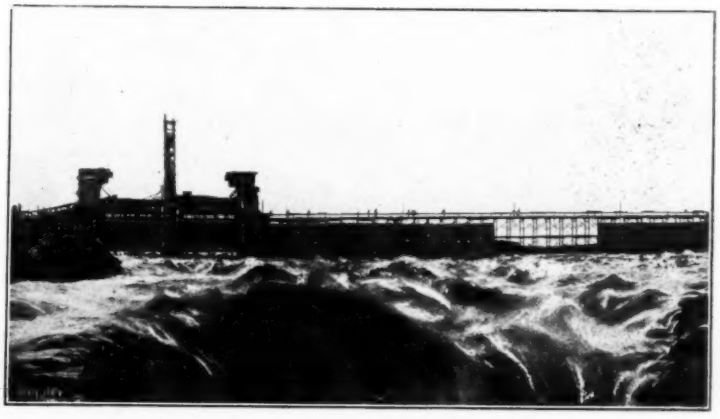


Fig. 2.—The Yarmuk in Flood during Construction of Dam.

A dam, figs. 1 and 2, 8½ metres high, and with 90 metres overflow and two 10 ft. × 4 ft. stone sluices, is being constructed across the Yarmuk to form a lake, fig. 3, of 1,000,000 sq. m. surface area, containing from 2 to 2½ million cu. m. of water, of which a million cu. m. will be available for diurnal storage. A canal less than 400 metres in length leads from the new lake to the forebay, from which four penstocks of three metres diameter will take the water down to the turbines.

An 8-metre dam is also being constructed across the Jordan, and from above the dam a canal, fig. 4, 1,800 metres in length and capable of carrying 60 cu. metres per second, is run to the new lake on the Yarmuk; thus the whole of the water in the Yarmuk and the Jordan is available for use by the turbines, and the Lake of Galilee will provide the seasonal storage. The bed of the Jordan below the power house is being deepened at present. The surface of the lake is 201 metres below sea level in winter and 203 in summer. It may be lowered to 204 m. when the works are in full swing. The Yarmuk dam is nearly completed; the head race is largely excavated, the forebay is three parts concreted, and the foundations for the turbines are going in. The Jordan canal has just been started, a powerful oil-engine driven Ruston drag-line excavator being hard at work—doing the work of 100 men—and a smaller excavator further along.

In Galilee all the rain falls in the winter months and none in the summer. The past winter has been abnormally wet, 21 inches of rain having fallen, compared with approximately 10 inches in 1927-28. The floods did considerable damage, washing a large amount of soil into the foundations of the power house, fig. 5; to save the forebay, a temporary dam of bags of soil had to be constructed. It also delayed the work, which is now, however, going ahead well, and which the engineers hope to complete within another twelve months. There are from 500 to 600 men employed on the scheme, which, in the main, started in July, 1928, although preparatory work started a year earlier.

The present scheme only makes use of approximately one half of the fall of the River Jordan between the lake and the power house, and when the present installation is fully employed additional power can be obtained by constructing a second power station higher up the river to utilise the

Fig. 3.—Site of New Lake.

other 27 ft. of head available, and finally it will be possible to construct a canal to carry the Yarmuk into the Sea of Galilee, and so make use of all the power available in both rivers. The site has one advantage over any other on the Jordan; the branch of the Hedjaz railway, which runs from Deraa to Haifa, passes through it; in fact, a small deviation had to be made to clear the railway track from the line of the head-race canal before the latter could be commenced.

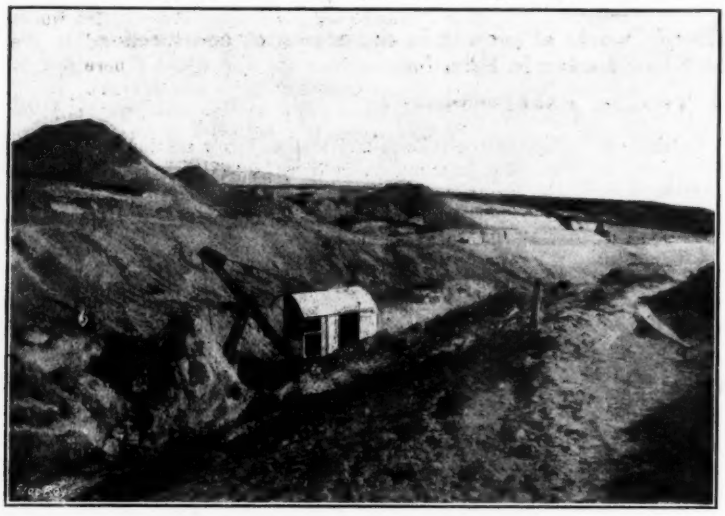


**Fig. 4.—Excavating for Jordan Canal.**

**Fig. 5.—Construction of Power House Foundations.**

Every care has been taken to provide for the health and comfort of the staff and workmen. Permanent bungalow-type houses, fig. 6, have been built for the staff and the first thing done was to lay out the grounds and plant trees, some of which are now firmly established and look healthy and green. It is most pleasing to see such care taken to make the works a civilised place. A camp has been built for the workpeople. There is no town of any size nearer than Haifa, 62 miles away. A hospital, with a doctor and nurse, is also provided, and there is a large dining room capable of seating some 500 persons, with window space all round, filled in with mosquito netting.

The generating pressure at the main station is to be 6,000 V, and it will be stepped up to 66,000 volts at an outdoor sub-station. Reinforced-concrete is being employed throughout for the structures, including the roof of the power house.

An interesting arrangement has been provided for clearing the grids of *debris* by back flushing. There are two gates and grids to each penstock, and flushing valves are fitted below, so that by closing either gate and opening the valve a back flush will carry the *debris* into a tunnel constructed in the concrete of the forebay, and so down to the river below. One double-circuit pole line on 19-metre poles will run from the works 62 miles to Haifa, and then down the sea coast to Jaffa. The Palestine Company's concession covers all Palestine, except Jerusalem, but if in the future the capital city should take a supply in bulk, the line would probably be continued on to there from Jaffa, and a return line to the works constructed up the Jordan valley.

The line from the works to Haifa will be steel-cored aluminium, 81 sq. mm. al. and 22.1 sq. mm. steel, but that by the sea will be copper, 64½ sq. mm. Difficulties have been experienced by the engineers in other places with corrosion of the composite wire when used near the sea. The poles are calculated for a larger section of conductor than will be strung at first, and for a pressure of 110,000 volts, to allow for increased load. The poles are being made in the company's workshops at Haifa, and are of the lattice-work type of construction. A commencement has been made with the erection of the line between Haifa and Jaffa. The foundations are made on the Malone principle; 15-centimetre holes are bored 2 metres deep, and a small charge of dynamite exploded at the end. When the leg of the pole is inserted it is grouted in and appears to make a very secure job. The local distribution will be at 400/230 V, transformed down in three stages, 22,000 V, 6,000 V, and 400 V. The 22,000-V lines will be used for transmission to villages in the neighbourhood of the towns supplied.

To encourage the growth of the load, temporary

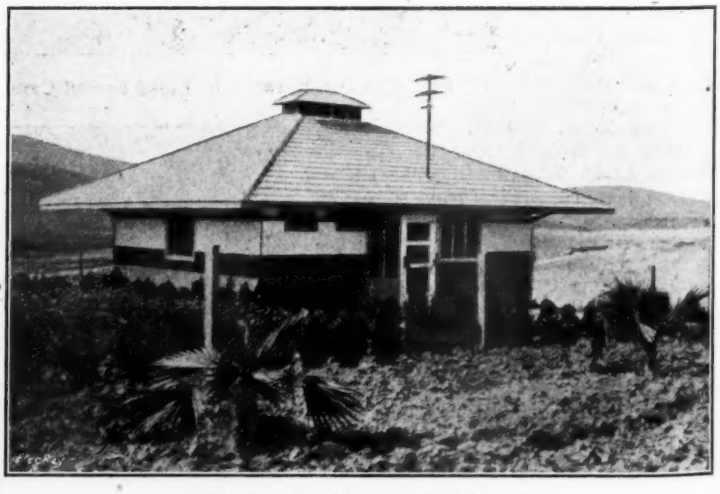


**Fig. 6.—Typical Staff Residence.**

Diesel plant has been erected and set to work at Haifa, Jaffa, and Tiberias. The last-mentioned is a small town a few miles from the works on the west side of the Sea of Galilee. At Haifa and Jaffa the temporary plant

generates at 6,000 volts and supplies by underground mains to sub-stations. At Tiberias generation is at 400 V. All the l.p. distribution is overhead, and it

**Figs. 7 and 8.—Overhead Lines in Tiberias.**

may be described as too well done. The lattice poles, cross arms, insulators, and the workmanship of erection are as good as in any overhead work anywhere. Figs. 7 and 8 are views of the overhead lines in Tiberias.

The design of the small power houses is remarkable. In outside appearance they are like private houses of the modern Dutch or German styles, figs. 9 and 10; no one at first glance would take them for power houses. At Haifa there is about 1,200 h.p. of plant, and at Jaffa about double that figure. The load for the works will come from lighting, ice-making in the towns and villages, power in Haifa and Jaffa, and pumping load in the coastal area, where the valuable orange crops require water. In the future water supply to towns and, finally, irrigation schemes will probably call for large amounts of power.

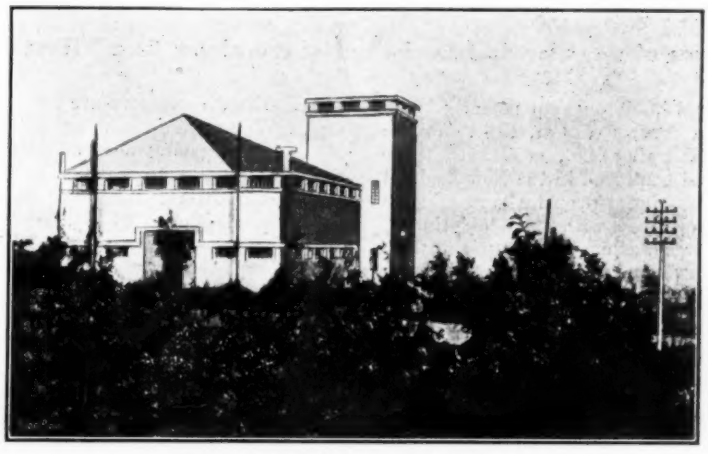


**Fig. 9.—Diesel Station at Tiberias.**

The government is about to start on the construction of a harbour at Haifa, and as there is no harbour which large vessels can enter to unload on the whole Palestinian or Syrian coast, this port, under the shelter of Mount Carmel, is likely to grow into an important commercial centre. It is also probable that the pipe-line bringing oil from Persia will terminate at the same point; this has not yet been settled.

The author is informed that the whole scheme is controlled, financed, designed, and constructed almost entirely by Jews, which is, of course, right and proper for a supply to Palestine.

**Fig. 10.—Haifa Temporary Oil-engine Station.**

Thanks are due to Mr. Rutenberg, at the works, and his staff, for the above information and the courtesy extended to the writer of this article on the occasion of his visit. The chairman of the company is Lord Reading, while Lord Melchett and Sir Hugo Hirst are on the board of directors. The authorised capital is £1,000,000; no public issue has yet been made. Fig. 11 shows the company's offices. The government requires that all plans of the works and mains should be submitted to the authorities for approval. There are no published regulations at present.

The design of the main power house is unusual; the windows are low down and the roof is a great reinforced-concrete vault. The structure is designed to suit the engineering conditions, and, incidentally, the vault roof will tend to keep the house cooler in summer when the outside temperature reaches on some days 112 deg. F. in the shade, in a deep river valley 800 ft. below sea level.

The efforts that the company has made to preserve the beauty of the country side where the power stations are erected are most striking. Palestine is a land of much beauty and unparalleled interest, and the company has set it as one of its aims that these amenities shall not be disturbed more than can be avoided.

Active steps have been taken to fight malaria, a prevalent complaint in the surrounding villages, with good results. In October, 1927, 17 per cent. of the men employed were down with the complaint, in October, 1928, 1.4 per cent., and today almost none. Besides keeping the "bugs" off with mosquito netting, they have been attacked by dusting Paris green on the surface of the ponds and pools in the neighbourhood.

The Government Health Authorities warned the company very seriously before it started work that owing to the prevalence of malaria the site selected was most unsuitable for the construction of a large works. The disease is chiefly fought by very strict discipline; all beds are fitted with mosquito curtains and every room in the camp is inspected every

night. No men may sit out of doors after sunset; they may walk, but must not sit. Any man who has a temperature for 24 hours is put to bed in the hospital until it is seen what is wrong. Scientific records of all illnesses are carefully kept and tests made as to the number of "bugs" in the air, in rooms, &c. The company has to try and keep the surrounding villages free from disease as well as its own works.

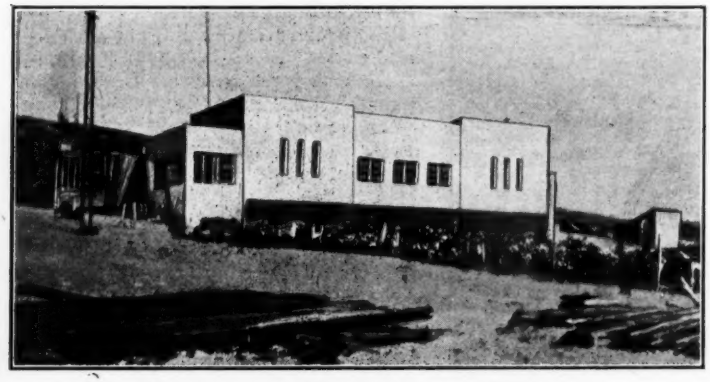


Fig. 11.—The Hydro-Electric Co.'s Offices.

The management takes no risk with regard to health. The men are fed extremely liberally, and not only do they keep well, but also work well. Numerous small accidents have occurred to the men, but there have been no cases of permanent disablement, and only one fatal accident.

The four turbines, of 8,500 h.p. each, are being constructed by Messrs. Boving & Co., Ltd , and the four 6,000-kW alternators by the General Electric Co., Ltd. All the plant has been purchased in Great Britain: excavators from Messrs. Ruston & Hornsby, Ltd.; shunting locomotives from Messrs. Hunslet; temporary Diesel plant from Messrs. Mirrlees, Bickerton & Day, Ltd.; compressors from Messrs. Reavell and Co., Ltd., and aluminium overhead conductors from the British Aluminium Co., Ltd.

# Electricity on Shipboard.

## Features of the Electrical Equipment of the Motor Boat "Rangitiki."

THE *Rangitiki*, the 17,000-ton ship recently built by Messrs. John Brown & Co., Ltd., for the New Zealand Shipping Co., is claimed to be the largest ship at present employed in the New Zealand trade, and also the first motor-propelled vessel in the owners' fleet. She is equipped with two 5-cylinder, 10,000-h.p. Brown-Sulzer Diesel engines for propulsion, which give the ship a service speed of 15 knots. Practically all the auxiliaries and services on the vessel are electric, and are supplied from two 500-kW and one 100-kW Diesel generating sets, employing Brown-Sulzer engines and generators by the English Electric Co., Ltd.

Some idea of the extent of the electrical installation may be gathered from the fact that 90 miles of cable and wire have been used, all of which was supplied by the Pirelli-General Cable Works.

In the contract for the electrical equipment of the ship, the General Electric Co., Ltd., was allocated a large share, an important section of which covers electric motors and switchgear. In all there are upwards of 120 motors installed for operating engine-room auxiliaries, deck machinery, steering gear, fig. 1, boat davits, ventilating fans, and so on. The switchgear includes a main switchboard, emergency board, nine auxiliary boards, refrigerator-plant switchboard, and also the motor control gear, much of which is of the automatic contactor type. The motors range in output from 150 h.p. for Reavell compressors, down to 1 h.p. for driving small Windsor fans. The deck motors are totally enclosed and watertight. The engine-room auxiliaries are served by 23 motors aggregating nearly 700 h.p.; these are of the drip-proof pattern. Several of them are also vertical-spindle machines, including those driving Drysdale forced-lubrication (fig. 4), sanitary, general-service, bilge, and fresh-water pumps. Many of them have variable-speed characteristics and are continuously rated. The motors for driving the winches, capstans and windlass, manufactured by Messrs. Clarke, Chapman and Co., Ltd., form an important group. Aggregating in all 940 h.p., they consist of twenty-four 30-h.p. winch motors, fig. 2, two 60-h.p. capstan motors and one 100-h.p. windlass motor. Four 12½-h.p. totally-enclosed watertight motors are provided for operating Welin-MacLachlan boat davits. Probably the greatest interest centres in the control of the motors. The 24 winches are

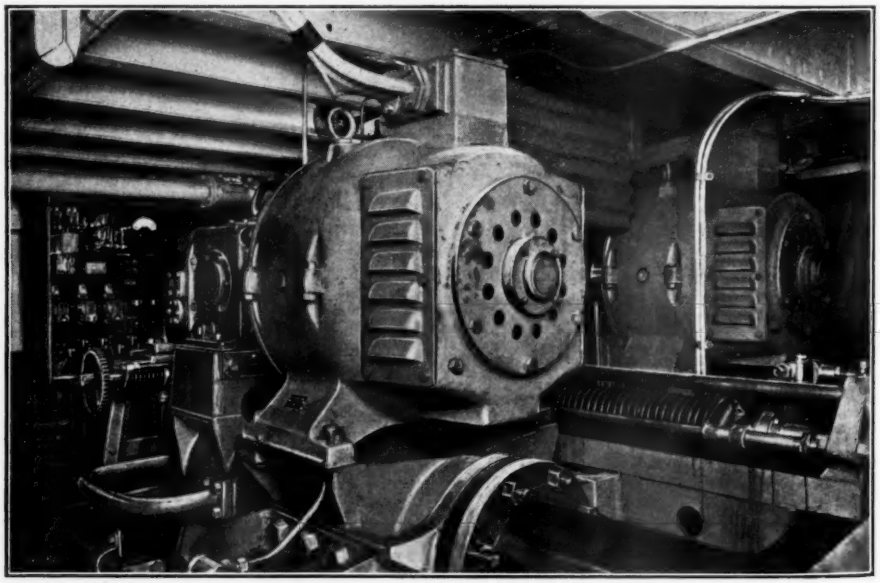


Fig. 1.—50-h.p. Steering Motors.

each governed by a master controller which actuates a contactor panel, and the acceleration of the winches takes place under current-limit control, thus safeguarding the

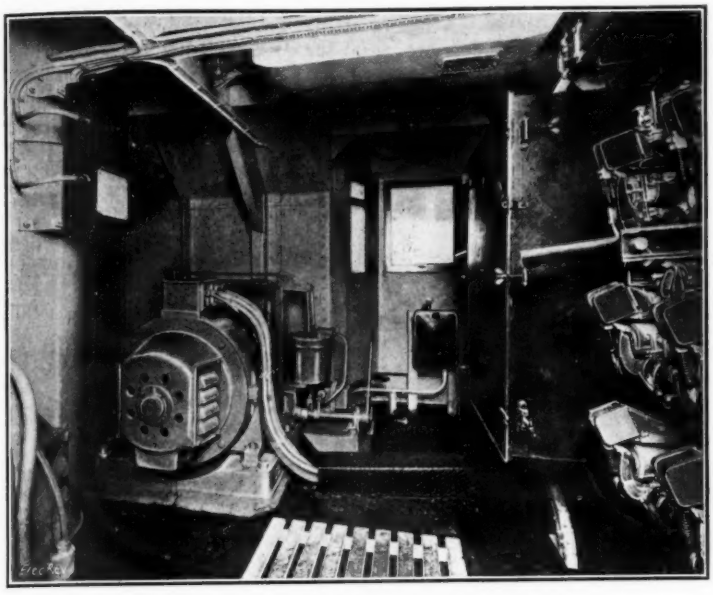


Fig. 2.—Winch Motor and Control Gear.

equipment from overload, while allowing high speeds to be obtained when running light. A special relay is provided to prevent damage from premature closing of the contactors, or from rapid reversal. In order that extra heavy loads may be dealt with, certain of the winches are arranged to be coupled in pairs and controlled by one master controller. Similar, but larger, equipments mounted below deck actuate the two aft capstans and the windlass. The numerous fans, which are driven by motors of from 1 to 5 h.p., fig. 6, are remotely controlled by automatic starters mounted below deck. These starters are of the type in which the motor's acceleration is controlled by its own counter e.m.f., and the field rheostat for speed variation is incorporated in the same case. This arrangement serves for the smaller sizes of motors in the engine room, while for the larger sizes pillar-type starters are used in which "line" contactors are employed in conjunction with hand-operated drum switches. The usual overload and no-volt protection is furnished, and the pillar may be isolated by a switch in its base, which must be opened to gain access to the interior. In the case of the 150-h.p. main air-compressor motors, the starters are of the pillar type in which the drum switch is replaced by a multi-switch starter which is actuated by a handwheel outside the case.

The two Hele-Shaw pumps of the steering gear, which are driven by 50-h.p. motors, are controlled by time-limit starters. These motors are arranged to be started up automatically by remote control from the engine-room switchboard, from the bridge, or by local control in the steering-gear compartment itself. In all cases the starting is fully automatic, and push-button operation is furnished. The main 220-V switchboard, fig. 3, is of the flat-back type. Of its 11 panels, two control the 550-kW main generators and two the 150-kW generators, while the remainder are feeder panels which distribute power to the nine auxiliary boards and also to other distributing points throughout the ship. A special feature of this board is the provision made for ensuring that certain "preference" circuits shall be in operation as long as possible in case of emergency. If for any reason the power supply is insufficient to maintain the whole of the services desired, provision is made on the board for enabling non-essential circuits to be tripped out. This is accomplished by a series of relays, with variable time settings, which come into operation in suitable sequence. The "preference" circuits are connected directly to the main bus-bars, the only overhead protection included being the generator circuit-breakers. The preference circuits include those supplying the steering gear, engine-room auxiliaries, emergency switchboard and the engine-room lighting.

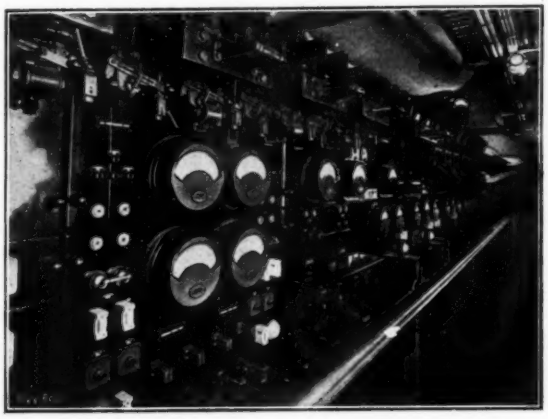


Fig. 3.—Main Switchboard.

The emergency switchboard has three panels, one controlling the emergency generators and the other two a panic battery, navigation lights, gyro compass, emergency lighting, floodlights for boat launching, searchlights, wireless, and so on.

One of the feeder circuits from the main board is taken to the 4-panel refrigerator board, from which are controlled the motors driving the brine pumps, water pumps and fans of the refrigerator equipment. This consists of three large horizontal

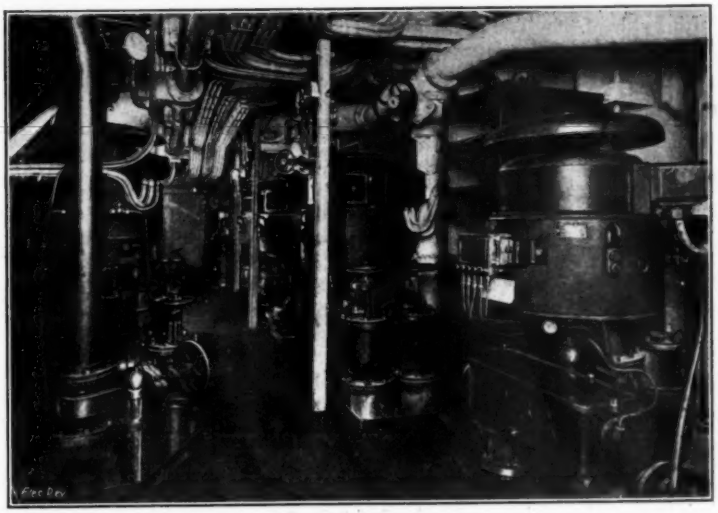


Fig. 4.—Drysdale Vertical-Pump Motors.

twin-compressor $CO_2$ machines, each driven by a variable-speed 110-h.p. electric motor manufactured by Messrs. W. H. Allen, Sons & Co., Ltd. This in-

stallation was provided by Messrs. J. & E. Hall, Ltd.

The General Electric Co. also supplied all the electric lighting fittings for the richly decorated public rooms, fig. 5. The lounge is illuminated by eight large bowl ceiling fittings and ten two-light wall brackets; these are of the Georgian style and finished in gilt to harmonise with the surroundings. The smoke room is lighted by means of four large amber glass ceiling lanterns and eight two-light candle brackets, giving a very pleasing effect. Beyond the smoke room is a verandah café in which are installed nine star ceiling fittings. In the forward drawing room are one large centre and six smaller bowl fittings which make the room particularly cosy. Table standards provide local illumination on the writing tables. The entrance and landings are lighted by means of a large number of small ceiling fittings, which provide a high degree of even illumination and are placed so as to be free from damage when luggage is being moved.

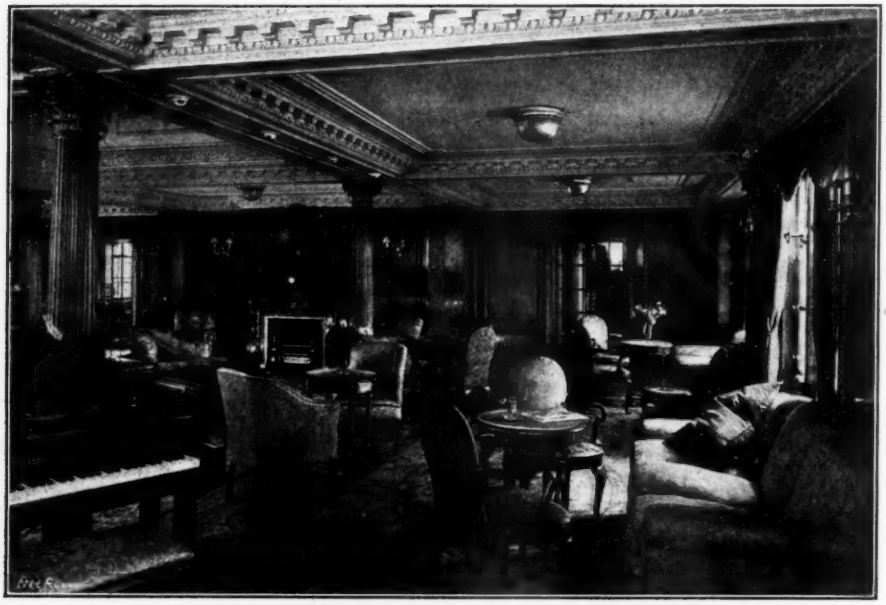


Fig. 5.—Lighting Fittings in one of the Public Rooms.

The ceiling bowl fittings so far described are fitted with crystal glass bowls frosted and cut. In marked contrast to these are the bowls in the dining saloon, where there are no less than seventeen ceiling fittings fitted with bowls of moulded glassware. Ten wall brackets to harmonise with the ceiling fittings are provided, and in addition there is local lighting from twenty-five table standards. The lighting of this saloon is brilliant, but without glare, and the sources of light are well screened. By means of dimmers the intensity of illumination can be varied, and different effects obtained.

The illumination of the first-class cabins is of an exceptionally pleasing character. Semi-indirect wall brackets of Roanoid, with tinted nacrolac shades, and pendant and berthlight fittings to match, produce an attractive and restful effect. Mirror brackets of similar design provide local lighting. In the En Suite Rooms the lighting is further amplified by means of moulded glass bowls set in the ceilings. The second-class public rooms are also well lighted, ceiling fittings with crystal bowls and globes and others with nacrolac bowls being employed. Additional lights in brackets are provided, and the whole effect is pleasing and harmonious. The lighting fittings provided for the third-class accommodation are of simple design, but throughout the rooms a bright and cheerful effect has been obtained by means of carefully chosen fittings.

The working alleyways and spaces are illuminated throughout by means of watertight brass stirrup fittings, while the decks and exposed positions are equipped with watertight bulkhead fittings. The engine room is lighted by means of lanterns fitted with gasfilled lamps, and a number of insulated portable handlamps are provided. The equipment for providing illumination for handling cargo at night is worthy of mention. Twenty-four derrick fittings of special design, equipped with 500-W gasfilled lamps, flood the decks and hatches with a high intensity of light, and fifty-four portable fittings with 100-W "Pearl" lamps are used in the holds and for temporary local lighting.

To comply with the Board of Trade regulations for launching lifeboats at night, eight overside lanterns, each with four 100-W lamps, are installed, and in addition four G.E.C. marine-type floodlights equipped with 500-W lamps are provided.

The G.E.C. fire-alarm system which is installed enables an alarm to be given from a large number of convenient positions about the vessel. At each call point means are provided for the insertion of a hand telephone into the circuit, so that communication can be made quickly between the call point and the officer on watch. A very complete system of passenger call bells has been supplied by the G.E.C., and includes local mechanical drop indicators, with bells adjacent to draw attention to the calls. The ship is equipped throughout with a system of intercommunication telephones, and a number of electric vacuum cleaners are carried for cleaning the carpets, upholstery and hangings in the various rooms, cabins, and so on.

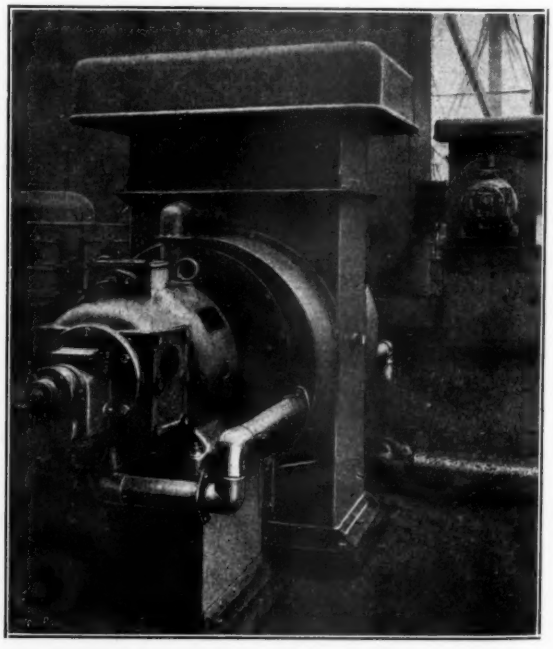


Fig. 6.—Motor-driven Ventilating Unit.

We are indebted to Messrs. William Esplen, Son and Swainston, Ltd., naval architects for the ship, and to the General Electric Co., Ltd., for the above details and photographs.

# Modern Coal-burning Methods.

## A Comparison of Solid and Powdered Fuels, with Particular Reference to Revenue Production.

By WILLIAM D. WYLDE, F.Inst.F.

THE existing rivalry, healthy though it may be, between those concerned in the boosting of each of the two methods of raw-coal firing predominant at the present time calls for unbiased thinking if the essential facts, distinct from elaborate claims, are of any importance in arriving at a decision as to which method will prove to be in practice superior to the other from the revenue producing point of view. The two methods referred to are the firing of coal in a pulverised state, and what is generally referred to as solid-fuel firing with the aid of mechanical stokers. For the purpose of these notes the writer is confining himself to the coal to furnace rate of flow in each case, which is, of course, one of the items usually included in the list of claims pertaining to the particular method advocated.

Taking, for the sake of simplicity, a half-inch sided cube of coal as the basis of the reasoning involved we are aware that the cubic content of a piece of coal of the foregoing dimensions is 0.125 cu. in., its weight at 80 lb. per solid cubic foot is 0.0058 lb., and the area exposed to air attack is 1.5 sq. in. By powdering the same cube so that the product is round about 125 microns, passing with ease through a 100 mesh sieve, the alteration in physical state is accompanied by the superficial area being raised to approximate 120 sq. in., the number of particles to 578,000 and the volume of each particle reduced to $216 \times 10^{-6}$ cu. in. From this it is seen that with the coal in a powdered state one pound exposes 20,640 sq. in. of surface area, whereas half-inch cubes fired solid to reveal the same area of coal surface would require $20,640/258 = 80$ lb.

Based on the fact that air and coal contact surface area is one of the main controlling factors of combustion speed, it would appear in the case cited that the rate of oxidation in one case is 80 times greater than in the other. This certainly is the case if we take the individual cube of coal pulverised in one case and solid in the other and time their rate of burning under identical conditions of air availability. Taken collectively, however, the foregoing desirable increase does not follow as a matter of course, because in the one instance the stated area is produced by one pound of coal being burnt in a fraction of time, and in the other the same area is available from 80 lb. of coal being thermally decomposed at one and the same time. In other words, up to and including the limiting area of exposed surface of the coal mass decided by the weight it is possible to have in the furnace at any instant, the difference in the rates of consumption per square foot of coal surface exposed in the two cases under consideration is nil.

What has just been stated does not of course signify that there is no difference in the weight of coal it is possible to consume in a given time, for the one reason that the former concerns coal weight and surface area and the latter coal weight and time.

To enhance the feasibility of the reasoning, let us take the case in which powdered coal of the aforestated degree of fineness leaves the fuel pipe at a velocity of 48 ft. per second, and in which the exposed surface area as it leaves the burner is 240 sq. in.

On this basis and taking the modern method of injecting the coal whirlwind fashion, the amount entering the furnace per foot of travel may be taken as being equivalent to the superficial area of a rectangular tube 12 in. × 16 in. × 15 in., *i.e.*, 0.0359 lb. Thus at a distance of say 8 ft. from the burner the weight admitted would be 0.287 lb., which at the velocity mentioned would be renewed six times per second.

Whatever distance from the burner is taken, with the injection speed constant the weight of coal entering the furnace per second remains the same, and in this particular instance is $48 \ (12 \times 16 \times 15)/120 \times 0.0058 = 1.72$ lb., which is the same as saying that the rate of firing is 297 half inch cubes of coal per second with the coal pulverised.

Taking the weight of coal delivered as being proportional to the increase in the speed of injection, the rates of consumption are as follows :—

| | | | |
|---|---|---|---|
| Fuel and air velocity | 48 ft. per second | = 1.72 lb. | per sec. |
| ,, ,, ,, | 56 ft. ,, ,, | = 2.0 lb. | ,, |
| ,, ,, ,, | 64 ft. ,, ,, | = 2.29 lb. | ,, |
| ,, ,, ,, | 72 ft. ,, ,, | = 2.58 lb. | ,, |

The method of representing the coal entering the furnace here quoted cannot be assumed to be the length of flame travel, although if the coal were solid carbon the representation would be more accurate than in the case where volatile or extraneous matter was in evidence to a marked degree. In the case of ash the particles not only retard inflammability, but they also remain in suspension. Taking it for granted that they take only a fraction of time in which to lose their luminosity, the speed at which they are travelling is such that the expiration of the flame is somewhat delayed. As an example, assume an injection velocity of 72 ft. per second with the speed at the tail end of the flame travel reduced to 40 ft. per second. By taking the time required by the ash particles to lose their light-emitting radiancy as 1/20 second, the flame extension would be 2 ft. The beneficial aspect of allowing the ash particles to give up their radiant heat before entering the first gas pass needs little comment. Further, it cannot be conclusively inferred that the length of flame travel is a function of the rate of coal to furnace flow in all cases for reasons exemplified by the fact that with the coal and air intimately associated before actually leaving the burner, it is possible to consume a given weight with the distance travelled by the air and coal stream in the furnace considerably curtailed. From this it may be reasonably concluded that the length of flame, apart from such considerations as coal-dust inflammability and explosive propensities, is controlled by (1) the speed of injection, (2) the weight of combustible per unit weight of coal, (3) the volatile content, (4) the size of the coal particles and those previously mentioned, viz., the ash content per unit weight of coal and the extent to which the coal and air are mixed prior to leaving the burner. In the case of (1), for a given set of conditions, increasing the speed at which the mixture leaves the burner would normally increase the rate of firing which would have for its resultant an increase in flame length proportional to the increase in the weight of coal entering the furnace and to the increase in the distance travelled by the coal per unit of time; on the other hand, increasing the velocity of injection with the fuel rate constant produces a flame length proportional to the increase in the injection speed only.

Based on the instantaneous rate of combustion under ideal conditions of fuel and air mixing, it would appear theoretically that by increasing the velocity by say 100 per cent. the distance travelled to complete combustion would be doubled, and with it the length of flame. On this basis it could also be stated that in the case

where the coal weight entering the furnace increases proportionately with the coal and air speed, the resulting flame travel is four times the original length. The results obtained in practice should not deviate to any great extent from the theoretical desiderata here referred to.

The variation due to (2) may be taken as being similar to that accruing from an increase in the rate of firing for reasons attributable to an increase in the weight of combustible per unit weight of coal being equivalent to an increase in the weight delivered to the furnace per unit of time; in other words, at the same injection velocity more combustible is consumed in a stated time with a corresponding increase in the actual flame length. Coupled with this there is, however, the fact that as the combustible increases the ash content decreases, and with it the prolongation of flame travel brought about by the ash particles as previously referred to. It is evident from this that there is a tendency towards a cancelling out procedure when the decrease in flame length with less ash equals the increase in flame travel due to the higher combustible content of the coal.

In the case of item (3) it is necessary to bear in mind that the subject of our attention plays a prominent part in deciding the distance travelled before combustion is completed, with the other controlling factors remaining constant. The why's and wherefore's are best examined by reference to the coal-burning process. By so doing we find that each particle of coal, after being raised to the volatile liberation temperature, is enveloped in the burning product of its own distillation, which, although to an infinitesimal extent, retards the air availability so essential to, and on which the rapidity of combustion depends. Considering the number of particles being dealt with the actual retarding effect becomes significant and represents a noticeable increase in the length of flame travel, even when the ideal air to fuel arrangements are in evidence. It is thus seen that for a given flame travel an increase in the volatile constituent necessitates a simultaneous reduction in the rate of firing, and the speed of injection to avoid the well known losses associated with the non-expiration of the flame before reaching the water cooled heating surface.

Item (4) is of importance in that the exposed area of the coal for a given weight increases proportionately with a decrease in the size of the particles, from which naturally follows a decrease in the time taken to burn the same weight with the cubic contents of the space occupied by the coal remaining constant. From the foregoing it may safely be contended that the minimum length of flame under ideal conditions of fuel and air mixing, when burning the nearest approach to solid carbon in a fine state of division, may be represented by the external surface area of a tube of the aforementioned dimensions renewed six times per second with the fuel velocity 48 ft. per second at minimum consumption, and by a tube 12 ft. long replaced six times per second at maximum consumption with the injection speed 72 ft. per second. Due allowance can be made for the flame-extending propensities of volatile and ash, and that resulting from the inefficient mixing of fuel and air before leaving the burner by catering for their needs when deciding the position of the burner and the combustion space volume required per burner for any particular grade and type of coal that it may be compulsory to consume from time to time.

Having outlined the rate of delivery to the furnace when firing coal in powdered form with one burner fulfilling the aforementioned requirements, the grate area required to consume the same weight of coal per hour in solid form may now be taken as a comparison. Referring again to the half-inch cube of coal, it is important to note that to obtain the same coal surface area exposed to air attack it would require 23,800 of the cubes in question at the lower rate of consumption, and 35,500 cubes at the higher coal consumption figure.

By reducing the coal size to $\frac{1}{4}$-in. cubes the figures are 95,200 and 142,000, respectively. On the other hand, by increasing the coal size to one cubic inch, the number of cubes required at the lower consumption is 5,950, and 8,900 at the higher rate of consumption, per second. Stated in terms of coal weight necessary to give the same superficial area, the foregoing is replaced by the following:—

Weight of $\frac{1}{2}$-in. cubes to give same area as 1.72 lb. of coal pulverised to the aforementioned degree of fineness = 138 lb.

Weight of solid equivalent of 2.58 lb. pulverised = 206 lb.

With $\frac{1}{4}$-in. cubes the weight for the same superficial area would be 69 lb. and 103 lb., respectively. For 1-in. cubes the necessary weight to expose the same area is as follows:—

1.72 lb. pulverised to 125 microns = 276 lb. solid.
2.58 lb. ,, ,, ,, = 412 lb. ,,

As before stated the difference in the coal weights when fired in pulverised and solid form does not signify that there is also a wide disparity in the weights consumed per unit of time. There is one thing, however, that is worthy of mention because of its significance, and that is that as the coal size is increased so does the difference in consumption in a given time tend to become pronounced as the coal weight per square foot of grate area per hour limit is approached.

It is evident from the preceding weights that with the coal reduced to half the original size, *i.e.*, $\frac{1}{4}$-in. cubes, the grate area required to obtain the same coal surface area is somewhat less. As will be seen the coal weight required is one half of that necessary with $\frac{1}{2}$-in. cubes, and the grate area required could theoretically be reduced to one half of the original area with the rate of coal to furnace flow doubled to maintain the same coal consumption per square foot of grate area, and at the same time meet the requirements of the more rapid rate of combustion made possible by the increase in the surface area exposed per unit weight of coal entering the furnace.

Conversely, when firing one-inch cubes the grate area required for the same effective air to coal surface area would be twice that required with half-inch cubes, with the rate of coal delivery halved to maintain the same consumption per square foot of grate area and allow for the decrease in the combustion rate brought about by the decrease in the coal's exposed surface area.

From this it would appear that to burn the same weight in the same time the grate area required would assume abnormal dimensions at the higher evaporative capacities and tend to cut out the competitive element associated with the two methods of coal firing.

Should the same coal be used in each case with the air distributing arrangements identical, the previously mentioned increase in grate area would not be compulsory if the conditions referred to later were realisable. Further, it is necessary to admit that in practice the coal size in question would have a somewhat higher heat value per unit weight, therefore the amount required for a given steam output would be less with the same overall efficiency maintained, thus offsetting to a certain extent the difference in the grate area required to produce the same superficial area as that of low-grade pulverised coal.

Referring again to the minimum consumption for the burner under consideration with a fuel and air velocity of 48 ft. per second, *i.e.*, 1.72 lb. per second, or 6,192 lb. per hour, it is seen that by allowing the conservative figure of 20 lb. of coal per square foot of grate area per hour, the grate area required is 310 sq. ft. In both cases, with the actual evaporation taken as 7 lb. per lb. of coal, the steam output would be approximately 44,000 lb. per hour. Comparing this with the higher coal-consuming rate, *i.e.*, 2.58 lb. per second, or 9,288 lb. per hour, with an injection velocity of 72 ft. per second, the grate area necessary with the consumption per square foot of grate area per hour as before would be 464 sq. ft.

The steaming rate based on the same evaporation per lb. of coal would rise to approximately 65,000 lb. per hour.

Allowing for an alteration in coal size it is seen that by halving the coal dimensions in the specific case out-

lined, the grate area at the two rates of consumption could be reduced to 155 sq. ft. and 232 sq. ft., respectively, with the coal replacement speed doubled. In other words, by raising the hourly consumption per square foot of grate area to 40 lb.

To those concerned with the commercial production of steam the latter may appear to be an absurdity. In any case the fact remains that given the same conditions of air availability in each case, it is possible to increase the speed at which the coal enters the furnace by reducing its size. This simply means that less weight is in the furnace at one and the same time, with the rate of renewal greater, therefore, with less weight of coal in the furnace at any instant, the grate area required is less, regardless of the apparent fiction attached to the figure obtained by dividing the coal consumed per hour by the grate area.

It matters not whether we have, say, 2 tons in the furnace renewed three times per hour, or 1 ton renewed six times per hour, the consumption remains the same providing the rate of combustion allows the higher rate of renewal to be attained. There is, of course, a limit to which the coal size can be reduced under the heading of solid-fuel firing, and that limit is obviously realised some time before the dividing line between the solid and the powdered state is reached, or, as it may be stated, when the weight of each coal particle is such that air in motion makes it mobile, the aforementioned limit has been reached and passed. Furthermore, it would require special attention to the air to coal distributing arrangements of the coal-carrying medium to overcome the blanket-like formation of a mass made up of exceptionally small pieces of coal.

This serves to emphasise the fact that to meet the needs of the various coal sizes met with in practice, it is essential that the grate should be designed for burning the smallest variety likely to be encountered, for the specific reason that it is easy to burn nutty coal on a grate designed for smalls, but not *vice versa*.

The effect of increasing the size to 1-in. cubes would also appear to demand in the two cases cited an increase in the grate area to 620 sq. ft. at the minimum consumption, and 928 sq. ft. at the maximum consumption, with the coal replacement speed reduced by 50 per cent., or stated another way, by halving the consumption per square foot of grate area per hour. Here again the rate of renewal question crops up. Under identical conditions of coal grade, air supply, &c., it takes a greater weight of coal to produce the same rate of decomposition, from which it is a foregone conclusion that either the grate area or the weight carried per square foot of area must be increased with a corresponding reduction in the speed of renewal. Obtaining an increase in the consumption for the same grate area with the speed of replacement lowered does not appear to be in this case a feasible accomplishment.

As it so happens, however, it would be possible in the majority of cases to increase the thickness of the fuel bed by 100 per cent. with coal of the size in question, without impairing the efficiency of the burning process, and it is on this score that it is possible to maintain the same rate of consumption at half the original speed of renewal with the air availability requirements as before.

It is evident from the preceding that by increasing the coal consumption per square foot of grate area per hour, by taking advantage of the available ways and means made possible by the increased superficial area per unit weight as the coal size decreases, coupled with modern methods of air to coal delivery from which rapid combustion accrues, it is possible to considerably reduce the grate area required by burning more per square foot for a given steam output.

Incidentally, it should be noted that it is also possible to assist in bringing about the latter by raising the steam pressure.

The advantages of these procedures will be seen at the nigher steaming capacities, as for example, a 312,000-lb. boiler with the same evaporation, *i.e.*, 7 lb. per lb. of coal, would require five of the burners referred to, compared with a grate area of 1,114 sq. ft. with an hourly consumption of 40 lb. per sq. ft. of grate area.

By increasing the steam pressure from, say, 250 to 600 lb. per sq. in., in which case the actual evaporation would increase to approximately 8 lb. per lb. of coal brought about by the higher temperature of the water entering the boiler, the number of burners would be reduced to four and the grate area to 975 sq. ft. for the same consumption per square foot per hour.

Such a grate area in these days of mechanical stokers, 24 to 30 ft. wide, is easily accomplished; therefore, from a rate of burning point of view the question of superiority recedes into insignificance.

Providing we do not take the criteria of the ideal method of burning raw coal as being the number of B.th.u. liberated per cubic foot of furnace volume per hour, which after all is not exclusively the decider of steam production efficiency, we are left with the microscopic difference in the thermal efficacy obtainable from the two methods of firing remaining as hitherto the only loop-hole for those who wish to be ultra-controversial in matters concerning the economical production of steam.

# An Electrified Metal Mine.

## Some Notes on the Use of Electric Haulage Locomotives in an Open-cut Copper-ore Mine in America

(COMMUNICATED).

THE mining properties of the Utah Copper Company at Bingham, in the United States, are said to be the world's largest electrified metal mine. Although the actual mining operations had already been electrified, up till the middle of 1928 the haulage system was of the steam type. Trials were made with an electric locomotive, which proved satisfactory, and plans were then made for the employment of 20 more, with suitable sub-station equipment. An additional 20 are to be added as soon as they can be built and delivered, and possibly even a few more will be required. Thus, the mine will have in use what is claimed to be by far the largest number of electric locomotives ever applied to open-cut mining operations.

The copper ore is found on both sides of the canyon in which the town of Bingham is situated. Electric shovels of the largest size, working on successive terraces, cut in the mountain face, remove the over-burden which covers the ore, and then the ore itself. The overburden is deposited in wagons that are hauled away by the electric locomotives and dumped down another side of the mountain, while the ore itself is hauled to the mills at Magna, 17 miles distant.

The locomotives were specially designed for this service; seven of the 41 machines are of a combination type particularly valuable for operation where power cannot always be collected from the usual overhead system. Each locomotive has facilities for overhead collection of electricity, side-arm collection, or for operation by means of storage batteries. In addition, the 41 locomotives are each equipped with a cable-reel collector by means of which power can be delivered to it over a considerable distance from the supply point by means of a trailing cable. The locomotives are of very heavy construction, each being rated at 75 tons.

Power for the haulage system is to be supplied from a number of sub-stations, two of which are already in use, and an extensive electrification system will be necessary for distributing the power to the points where it is needed.

The electric locomotives haul the ore cars up the side of the mountain by means of switchbacks, over the various benches, and to the shovels. There the wagons are loaded and hauled back to the foot of the mountain, where they are made up into long trains and transported to the mill by the railroad.

The locomotives are described as being of the articulated-truck, steeple-cab type, with rigid frames, made up of heavy steel-plate sides carried on combination semi-elliptic and helical springs. The main cab of the storage-battery type engines is over ten feet square, and in the cab are the driver's seat and control gear with other necessary electrical equipment.

Four large totally-enclosed motors drive each locomotive; the motors are controlled on a single-unit, three-speed, control system arranged for series, series-parallel, and parallel operation, with resistors of sufficient capacity for the service cut-in and out by solenoid-operated contactors. Complete protection and metering equipment is provided by suitable relays and instruments.

The overhead pantagraph trolley is raised by a spring and lowered by air pressure, both operations being controlled by the driver in the cab. In addition, there are two side-arm pantagraph trolleys, one mounted on each side of the cab room; they are extended and withdrawn by air, and also under control of the driver.

The electric cable reel, mounted under the platform beneath the cab, carries a suitable length of flexible rubber-covered cable, and is of the vertical-axis type driven by a motor which automatically winds and unwinds the required length of cable as the locomotive moves toward or away from the source of power.

In the storage-battery locomotives a ball-bearing motor-generator set in the cab is arranged to charge the battery through its control gear without the use of a charging resistor. A two-stage air compressor, also in the cab, provides the necessary air for operating the air-brake equipment.

# Small Electromagnets.

## A Suggestion for a Simple and Effective Improvement in their Design.

By L. H. G. DINES.

IT seems curious that in making small electromagnets for use in such apparatus as electric bells, relays, electric clocks, &c., very little attempt is usually made to obtain the maximum pull on the armature in relation to the current required to work the magnet.

The ordinary arrangement is similar to that shown in fig. 1: two soft-iron cores A and $A^1$ are fixed in the iron yoke Y; coils C and $C^1$ wound on bobbins are slipped on the cores, and an iron armature $BB^1$ mounted on a spring or on bearings is attracted towards the poles $a$ and $a^1$ when the current flows. If we denote the mean thickness of the air gap between $a$ and B and $a^1$ and $B^1$ by the symbol $t$, it is well known that the force of attraction on $BB^1$ increases very rapidly as $t$ decreases. Hence any design

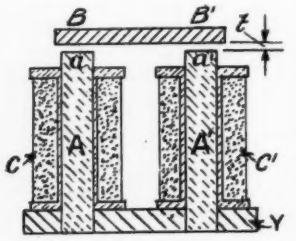



Fig. 1.—Ordinary Electromagnet.

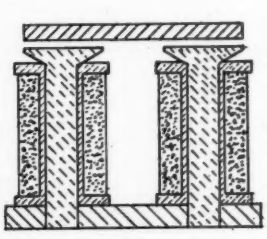


Fig. 2.—Magnet with Splayed Core-Ends.

will give a good pull when $t$ is small, and the problem is to obtain a better pull when $t$ is large at the expense of some of the unnecessarily large pull when it is small.

A very simple and effective way of doing this is shown in fig. 2: in this case the ends of the iron cores are splayed out till the area of each pole face is about six times as great as the cross section of the core, and the size of the armature is increased to correspond with them. By this means the pull on the armature is in general greatly increased; under conditions of working which do not involve too high a degree of magnetisation of the iron, the pull on the armature when $t$ has its maximum practicable value may be increased to as much as three or more times its value in the case of fig. 1, the windings and current being the same in the two cases.

The explanation will be obvious to those accustomed to the design of electrical machinery—one is simply reducing the magnetic resistance of the air gap by increasing its cross section. The writer has made numbers of small electromagnets on this principle, and the practical results obtained have supported the theoretical considerations.

It is obvious that if efficient magnets are required the accepted canons of dynamo design must be respected; it is, for example, quite possible in increasing the area of the pole faces to so reduce the resistance of the leakage path that no benefit results. Also, less advantage will be gained if the cores are working under too high a state of magnetisation. As a rough guide the writer has found that so long as the winding does not exceed 40 ampere turns per centimetre of the total length of the magnetic circuit, the enlargement of the pole faces and armature described above is very advantageous.

Objection may be taken that the design shown in fig. 2 is more expensive to construct than that in fig. 1. This may be met by the simple expedient of threading the ends of the cores in fig. 1 and screwing on steel nuts to form the enlarged pole faces. A Whitworth nut gives an enlargement ratio of $3\frac{1}{2}$ to 1, which is enough to secure a considerable improvement in efficiency, but it is better if possible to obtain the full increase of 5 or 6.

In high-class work the coils would probably be wound directly on to the cores without separate bobbins. To such cases the type of core illustrated in fig. 2 lends itself well, for by constructing the cores with bottom flanges they form their own bobbins on which to wind the wire.

# Variable-speed A.C. Commutator Motors.

## Notes and Comments on Some of the More Recent Types of Machine.

By C. V. HILL.

*(Extracts from a Paper read before the* ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.)

COMMENCING with a short historical survey, followed by descriptions of the early types of variable-speed commutator motors, both series and shunt, the paper then went on to describe rather more in detail the more recent type in which speed variation is produced by varying the voltage applied to the rotor through a trans former or induction regulator.

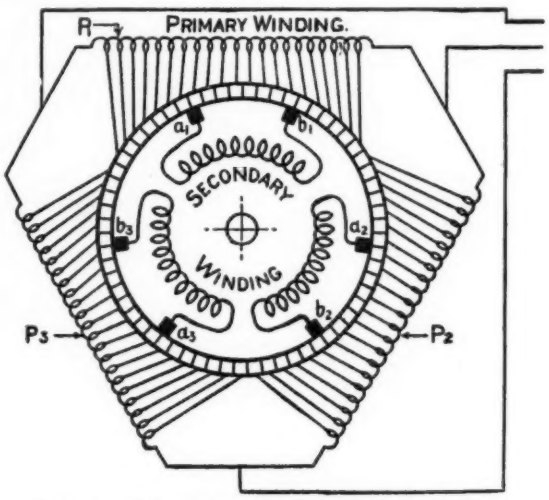



**Fig. 1.—Elementary Diagram of 3-ph. A.C. Commutator Motor.**

*The Eichberg 3-phase Shunt Characteristic Commutator Motor.*—The desirability of a machine having shunt characteristics is obvious, and there have been several attempts to produce such a machine. One of the earliest of such motors is the Eichberg motor; the stator resembles that of an ordinary induction motor, and the rotor is similar to that of a d.c. machine. The stator is connected to the supply mains, but the armature is connected to the secondary of the transformer, the primary of which is also connected across the supply mains. The secondary of the transformer carries a number of tappings, and hence the voltage impressed on the armature can be varied at will.

The principle of operation can be seen from the following considerations. The stator produces a rotating field which travels round the machine at supply frequency as in the case of the induction motor. The armature cutting this field has a voltage induced at the brushes which varies with the speed of the armature. At standstill this voltage is maximum, zero at synchronous speed, and once more the standstill value at a speed of twice synchronous speed, but with a reversed sign.

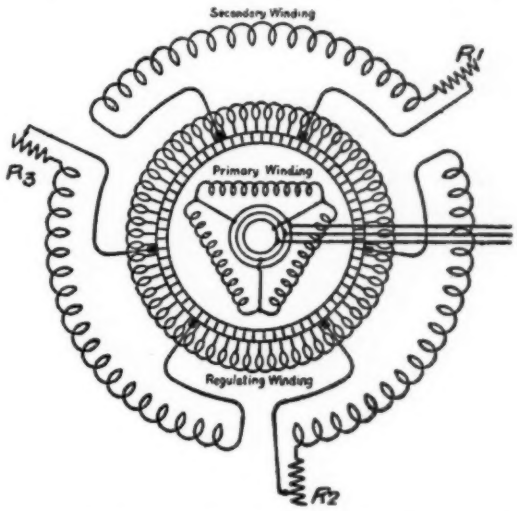
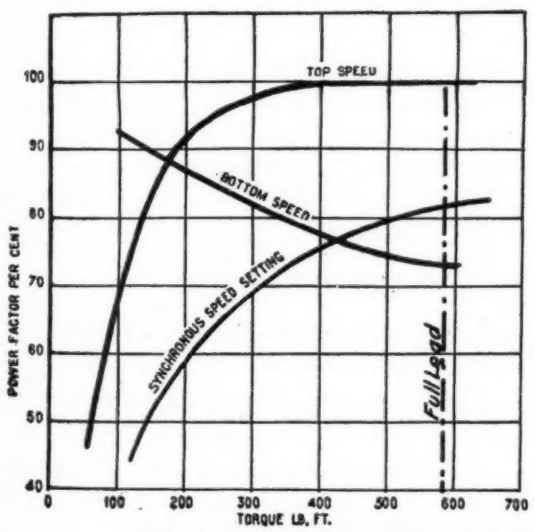
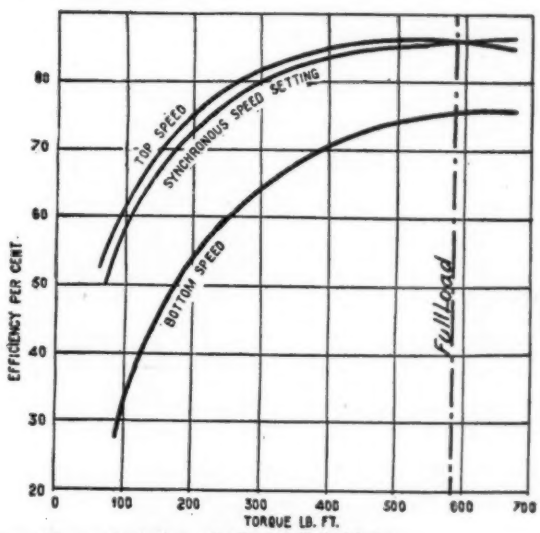



**Fig. 2.—Diagram of Windings of Schrage Motor.**

Since the brushes are stationary in space the frequency at the brushes due to the revolving field will always be full frequency. Hence it is always possible to apply to the brushes the voltage at full frequency derived from the supply mains through the transformer.

At light loads no torque-producing current must flow in the armature, so that it will readily be seen that the condition of stable running is at such a speed that the voltage induced by the main field taking account of the rotation of the armature shall be equal to the voltage impressed on the armature from the transformer.




**Figs. 3 and 4.—Power-factor and Efficiency Characteristics of Type CH Motor.**

Speed variation is produced by varying the impressed voltage by means of the transformer tappings, and the number of possible speeds is limited to the number of such tappings available.

*The Schrage Variable Speed A.C. Commutator Motor.*—In order to remove the defects of the foregoing motor, it is necessary to resort to principles successfully embodied in a motor due to Schrage, which has proved to be the most successful variable-speed motor so far developed.

The principle of operation of shunt-characteristic variable-speed motors has been shown to be that an e.m.f. derived from some suitable source of the same frequency must be impressed on the rotor windings in addition to that voltage induced in them due to the rotation of the rotor

If the speed is to be above synchronism the impressed voltage must be in the same sense as the induced voltage, and if the speed is to be below synchronism the impressed e.m.f. must be in the opposite sense to the induced voltage.

The Schrage motor is an induction motor in which simple means have been found for producing such a voltage which can be varied so as to produce speeds either below or above synchronism. These means can be best understood from the following considerations. Fig. 1 shows a primary winding consisting of three phases connected to a commutator. A secondary winding is shown which can be connected to brushes carried in separate brush rings, so that the brushes (*a*) at the one end of the secondary phases can be separated from brushes (*b*) at the other end of the phases. The voltage impressed across each phase of the secondary winding will be proportional to the separation of the brushes. If now the secondary with the brushes is made to rotate in the same direction as the rotating field, but with the brushes disconnected from the windings, we see that the voltage across brushes (*a*) and (*b*) is constant, depending only on their distance apart on the commutator. The frequency of the voltage depends on the speed of the brushes. At standstill it is full frequency; at synchronous speed (the speed of the magnetic field) the frequency at the brushes is zero. Since the secondary windings are also rotating at the same speed, the frequency induced in them will be the same as at the brushes, so that the brushes can be connected to the secondary windings, without bringing together different frequencies. If now the brushes are brought together the arrangement of windings corresponds to a simple induction motor, and the machine will run as such with a speed near synchronous speed, according to the load. As the brushes are separated there is an e.m.f. impressed on the secondary in a sense which depends on the direction in which the brushes are moved, the voltage being independent of the load. Thus the conditions for a variable-speed machine with shunt characteristics as stated above are satisfied.

There are certain modifications to the above arrangement to make it a practical workable machine. It would obviously be difficult to rotate the brushes, and so the secondary winding and the brushes are attached to the fixed element or stator, and the primary is carried round on the rotary element. This, of course, does not in any way affect its operation as an induction motor, but it enables the machine to be fitted with a commutator of conventional type, carried on the rotor.

It is also necessary, in order to reduce the voltage between segments to a suitable figure, to keep the commutator and primary winding separate, arranging their turns such that the commutator winding obtains its voltage by transformer action from the primary, but suitably reduced in magnitude. The commutator and brushgear is thus kept isolated from the higher voltages of the supply mains, and they can safely be handled when the machine is running.

The actual arrangement is shown diagrammatically in fig. 2, and is as follows. The primary winding is placed at the bottom of the rotor slots and connected to the sliprings. The secondary winding, which is similar to that of an ordinary direct-current armature, is wound above the primary winding, and the ends of the coils are connected to the commutator just as in the case of a d.c. armature. The brushgear is arranged on two separate yokes, and these are connected together by racks and pinions. The starts of all secondary phases are connected to the brushes on one yoke, and the finishes of the phases to the other brushes.

On separating the brushes the impressed voltage varies in proportion to the separation, and in sense according to which direction the brush yokes travel. The maximum movement on either side of synchronism is 90 electrical degrees. The speed range depends upon the relation between the turns in the regulating and secondary windings.

If A is the ratio of the number of turns in the regulating winding to the number of turns in the secondary winding, and N is the synchronous speed, then the speed range of the motor at light load will be from $N(1-A)$ to $N(1+A)$. The value of A must be less than unity.

The motor runs efficiently at all speeds, only power proportional to the speed being taken from the mains. Since, however, the flux is constant, the torque will be constant for constant secondary current, the horse power being proportional to the speed. It is also evident that the commutator and regulating winding handle only power which is proportional to the departure from synchronous speed, *i.e.*, the slip power, and so are highly loaded, compared with the total output of the motor.

The Schrage motor can be built for a wide range of speeds and horse powers within the limits imposed by good design. Briefly, these are :—

In the first place the speed range obtainable is limited chiefly by considerations of the secondary power factor. The power factor depends on the ratio of resistance to reactance, and for constant current the reactance is low at synchronism, and higher as the speed is reduced below synchronism, due to the increasing frequency. This imposes a limit on the speed range, and since for small machines the ratio of resistance to reactance is greater than for larger machines. The possible speed range is of the order of 3 : 1 for 50-cycle machines, corresponding to a frequency in the secondary of 25 cycles, *i.e.*, the speed range goes from (50+25) to (50−25) cycles. Small motors up to about 20 h.p. can be built for 5 : 1 speed ranges, and for 50 cycles even up to 80-h.p. motors with 4 : 1 speed range have been successfully built, and for 25 cycles up to 100 h.p. with speed ranges as large as 4½ to 1.

Another design limit is imposed by the permissible voltage between adjacent segments of the commutator. It must be small, since it governs the current in the coil short-circuited by the brushes during commutation, and also to obtain smooth variation in speed. This voltage, assuming a single turn as the minimum possible, is dependent on the flux and the speed. This places a limit on the flux per pole and hence the output per pole. This tends to make the larger machine have a large number of poles, and hence to run at slower speeds than the smaller motors. The use of specially designed windings increases the range of output considerably, but the maximum output is found to be between 250 and 300 h.p. on 50-cycle circuits. Above this output, however, it is possible to employ two separate machines mounted in tandem with their brush-operating mechanism mechanically coupled, and sets of 500 h.p., as above, have been successfully built in this way.

The foregoing shows how important it is that the synchronous speed shall be placed in the middle of the required speed range, so that the power handled by the commutator shall be evenly distributed above and below synchronism, and so kept to a minimum. It is therefore always most economical to adopt the speeds that best suit the design, having reference to the output and speed range required, and to convert these speeds to those of the driven apparatus by interposing suitable gearing. Where this cannot be done, a large and comparatively expensive motor is usually the result.

Whilst the ratio of resistance to reactance makes for a poorer power factor below synchronism, the reactance drop only has this effect at sub-synchronous speeds, as at super-synchronous speeds the drop is a leading one and causes power factor improvement, the value obtained being high and often unity or slightly leading at full speed. It can, however, be improved at the lower speeds by adopting the principle of differential brush shifting. This means that one set of brushes is made to move faster than the other, and so the axis or mean position between the brushes is made to move in the opposite direction to that in which the motor is running. The phase of the voltage across the brushes is thereby altered, introducing a component 90 deg. out of phase with the main voltage, and making for power factor improvement. The starting torque and also the maximum torque of the machine are also improved.

At standstill, a value of approximately 1¾ to twice normal full load torque is obtained with the brushes in the position corresponding to the bottom speed within the range. The primary current with this value of starting torque will be approximately equal to 1½ times full-load current. Thus it will be seen that with the brushes set for bottom speed the starting current can be kept down to a suitable value without the introduction of any secondary starting resistance.

This means that for machines of normal speed range it is only necessary to connect them directly to the supply mains at starting through a simple oil switch or its equivalent. In order to ensure that the brushes shall be brought to the correct minimum speed position before the motor is started, a small interlock is provided on the endshield, which has its contacts bridged when the brushes are in the correct position by means of a striker on one of the brush rings. The interlock is in the low-voltage release circuit of the oil switch, which thus cannot be closed until the interlock is closed.

(*To be concluded.*)

# Parliamentary News.

[By Our Special Parliamentary Reporter.]

## The Severn Barrage Scheme.

On April 23rd, Colonel Ashley informed Sir W. Preston that the question of the practicability of constructing a barrage across the River Severn for the purpose of generating electric power by tidal water was being investigated by an expert committee which was appointed on the recommendation of the Committee of Civil Research. It was not possible to give any useful estimate of the number of men who might be employed on any scheme of that kind.

## State Telegraph Services.

On April 23rd, Sir W. Mitchell-Thomson, the Postmaster-General, informed Mr. Wellock that the following were the

approximate numbers of telegrams sent and received in the first quarters of 1928 and 1929:—By the Post Office "Beam" stations:—Last year, 451,000; this year, 506,000. By the Imperial Cables:—Last year, 115,000; this year, 123,000.

### Television.

On April 23rd, Mr. DAY asked the Postmaster-General whether any agreement had now been arrived at between his department and the British Broadcasting Corporation by which facilities would be granted for the purpose of broadcasting television; and could he state which station the British Broadcasting Corporation would be utilising for the experiments.

Sir W. MITCHELL-THOMSON said he had already announced his willingness to agree to a B.B.C. station being utilised for television experiments outside broadcasting hours. The Corporation, however could not provide the desired facilities for simultaneous transmission of speech and television until the completion of its new station at Brookmans Park, which was expected to be ready in July next.

### The Battersea Power Station.

On April 25th, in the House of Lords, Lord JESSEL called attention to the menace to the health and amenities of London by the erection of the Battersea power station. He said that the station would be erected within 300 yd. of Westminster and would be the second largest in the country. It was expected to consume some 800,000 tons of coal, and six chimneys, each 255 ft. high, would be erected. They would not be very picturesque and the sulphurous fumes would corrode many of the important buildings in the neighbourhood.

Lord LONDONDERRY, the First Commissioner of Works, said that, as a result of science, smoke and grit need no longer be a nuisance to the public. The erection of this station, which was only a third of the full scheme, would mean that three others already built at Horseferry Road, Westminster; Wood Lane, Shepherd's Bush; and Richmond Road, Earl's Court, would be dispensed with, and the sulphur fumes reduced by 30 per cent. He could give an assurance that the further extension of the station would not be undertaken unless there was no danger to health and no destructive sulphur fumes. Unless the Minister of Transport, the Minister of Health, and himself were satisfied on the advice of the Government chemist and of the Department of Scientific and Industrial Research that there would be no danger the scheme would not be completed.

Lord CRAWFORD, while welcoming the assurances of the Government, called attention to the fact that the "main transmission lines" were to be taken through Hyde Park and four other public parks. He objected to these lines being taken overground by unsightly upright metal structures, and, as for underground lines, he had always regarded the Royal parks as sacrosanct from digging operations. He hoped the Government would consider the long distance transmission of electricity, as had been done in the Ruhr.

Lord LONDONDERRY said that the scheme had been fully considered in all its aspects, and those responsible for it were convinced that the alleged dangers were largely illusory and that the difficulties would be overcome. Any further extensions would be reviewed in the light of the experience gained.

At the conclusion Lord Jessel withdrew his motion.

### Galloway Water Power Bill.

On April 25th, in the House of Commons, on the order for the second reading of the Galloway Water Power Bill, Lt.-Col. MOORE moved its rejection. He objected to the proposals of the promoters to erect a high barrier at the mouth of Loch Doon, to raise its level from 23 ft. to 38 ft., and to reduce the quantity of water released to 45,000,000 gallons a day. That was a totally inadequate quantity of water to preserve the health of the community or to give the necessary assistance to the industrial organisations which depended on that water. The balance of the water was to be taken away by the promoters on to another watershed, the watershed of the Dee, in another county, and they were there going to erect power stations for generating electricity for a county outside that of Ayr, the county of Kirkcudbright and Galloway generally. The people of Ayrshire felt they were being robbed of their birthright.

Labour members opposed the Bill because they maintained it to be their duty to see that electricity was kept in the hands of the community and not used for exploitation by private persons.

Col. ASHLEY, the Minister of Transport, said it was against the public interest to oppose the second reading of a Bill simply because it was promoted by private enterprise. The whole idea of the scheme was to make electricity available, not only for other districts in Scotland, but for parts of North-West England. By it it was hoped that the cost of electricity to the consumer would be reduced. It was the considered opinion of the Electricity Board that the scheme would supply electricity to the grid, in the industrial areas of Scotland, and in the country districts as well, distinctly cheaper than would be possible from a steam station.

The Bill was read a second time by 99 votes to 39.

### Private Bills.

The Chatham and District Traction, Cheltenham District Traction, Derbyshire and Nottinghamshire Electric Power, Jarrow and South Shields Traction, Mansfield District Traction, and Yorktown (Camberley) and District Gas and Electricity Bills have been read a second time in the House of Commons. These Bills have all passed the House of Lords.

### The Dissolution Date.

The Prime Minister stated last week that the date of prorogation and dissolution of Parliament would be May 10th; nomination day would be May 20th, and the general election would take place on May 30th.

# Business and Industrial Notes.

**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.**

### Australian "Anti-Dumping" Duties Revoked.

*The Times* reports that the Commonwealth anti-dumping duties, imposed after the war on the products of countries with depreciated currencies, were revoked by proclamation on April 26th. The countries affected are Germany, Austria, France, Spain, Portugal, Belgium, Czecho-Slovakia, Luxembourg, and Hungary.

### Exports and Imports: Volumes and Values.

The *Board of Trade Journal* for April 25th reviewed our foreign trade during the first quarter of the current year giving the corresponding values in the first three months of 1924, the values in 1929 at the average values ruling in 1924, and the average values and quantities as compared with 1924. From the tables it is seen that the declared value of exported electrical goods and apparatus rose from £2,336,000 in 1924 to £2,788,000 in 1929, but, calculated on the 1924 values, the 1929 total amounted to £3,023,000. While the average values fell to 92.2 per cent. of the 1924 figure, quantities were 129.4 per cent. of the 1924 volume. Retained imports rose in value from £633,000 to £1,216,000, or in 1924 values to £1,488,000. The volume represented 235.1 of the 1924 volume, but the average value fell to 81.7 per cent. of the 1924 figure. So far as machinery (including electrical machinery) is concerned, while the exported quantity represented 129.4 per cent. of the 1924 volume, the value was 95.0 per cent. of the 1924 value. Imports of machinery rose to 199.6 per cent. in volume, and fell to 96.3 per cent. in value.

### Supply Authorities' Publications.

We have received from the borough electrical engineer and manager of Halifax (Mr. F. N. Rendell-Baker) a copy of the April number of the Corporation's "Electric Supply Gazette." This is an attractive quarterly magazine containing well-illustrated articles and notes on varied electrical matters, particularly developments in Halifax. Some information is given regarding the Halifax Electrical Development Association, in which the supply department and local wholesalers and contractors are represented.

The borough electrical engineer and manager of Bacup (Mr. H. Tetlow) has sent us a brochure dealing with the Corporation's hire-purchase and assisted wiring schemes. This contains not only illustrated details of the apparatus available, but a great deal of general information regarding the use of electricity, including the cost per hour of operating various appliances.

## Batti-Wallahs' Society Luncheon.

Sir Hugo Hirst, Bt., chairman of the General Electric Co., Ltd., was the guest of honour at an exceedingly well-attended luncheon of the Batti-Wallahs' Society held on April 25th, at the Hotel Cecil. The new president of the Society, Mr. H. L. Howard, was duly installed by Mr. R. W. Hughman, the past president, who said how proud they were to commence a new session with a gathering which was a record.

Sir Hugo Hirst dealt mainly with his experiences as a member of the British Economic Mission to Australia, and suggested that as he was speaking on Anzac Day, a message of greeting should be sent from the Batti-Wallahs to Sir John Monash. He explained that the Mission went out with the idea of studying Australia from the Australian point of view, and with the intention of learning at first hand everything it could about Australian conditions. He pointed out that while the population of Australia was only some six and a half millions, the purchasing power of the population was far greater than a normal six and a half millions in European countries, and that far greater attention should be given to supplying the Australian market with what it wanted, rather than with what we had to sell at home. There were in Australia six self-governing States, each with its own special aspirations, and each of the States must be considered carefully as a separate entity. Australia was thought of in this country as being mainly agricultural, but two-thirds of the population actually lived in towns and those towns were just as advanced, or more advanced than, our own. We must get rid of the idea of the Australian population being engaged in agriculture. Australia was manufacturing, and would continue to manufacture, and it was our duty to study the products which could usefully be made in that country. Australians were intensely loyal and would far rather purchase the goods which they did not manufacture from Britain if economic conditions permitted them to do so. He was satisfied that a young country could not produce scientists and engineers quickly enough to meet the demand, and we must help them by sending out our own. Australians aspired to play a stronger part in all matters concerning the British Empire, and we should do everything by means of personal contact to enable them to realise those aspirations.

Sir Hugo's speech, which was most enthusiastically received by the large audience, was followed by a few words of thanks from Mr. Henry Horne, who did so much to assist Major Sir Henry Segrave to set up the world speed record with the "Golden Arrow."

## A G.E.C. Fan Display.

According to the GENERAL ELECTRIC CO., LTD., the prospects for the sale of fans during the coming months are very bright, for l'Abbé Moreux, of Bourges Observatory, predicts that the summer of 1929 will be unusually hot and dry. Nevertheless, fans will not sell themselves and the company has therefore drawn up a scheme for aiding retailers. Advertisements of "Magnet" fans are to appear regularly in commercial, industrial and technical journals and high-class magazines. In addition, there will be available attractive folders (arranged for overprinting), show cards, and a "breezy" cut-out for window displays and counter demonstrations. The company has introduced a new range of induction-type fans for desk and bracket mounting.

## An A.T.M. Play.

On April 15th, at the Balfour Institute, Liverpool, the A.T.M. Dramatic Society gave a very successful rendering of Noel Coward's three-act comedy "Hay Fever." As a result of close application and frequent rehearsing, this energetic society is making excellent progress, and the result as exemplified in this performance, reflects great credit on the producer, Mr. Thos. Fisher, as well as upon individual members. The musical portion of the programme was furnished by the A.T.M. Orchestra, some 30 strong, under the direction of Mr. C. Brandreth.

## Local Exhibition.

BESSECARR.—An electrical exhibition was arranged last week by the Yorkshire Electric Power Co. The display was in charge of the assistant sales engineer, Mr. A. W. Thorpe, and demonstrations of electrical devices were given daily.

## Book Notices.

"The *Electrician* Annual Tables of Electricity Undertakings, 1929." Pp. vii+212. London: Ernest Benn, Ltd. Price 10s. net.—This is the 42nd annual issue, and it has been revised so as to include particulars of many new undertakings, together with details of projected schemes, &c. Additional information regarding mains and distributors, converting plant, output for the year, showrooms, &c., which has been inserted in the present edition, increases the usefulness of these tables.

We have received from Sir Isaac Pitman & Sons, Ltd., a copy of their spring list of books for 1929, which includes a variety of subjects of interest to electrical engineers.

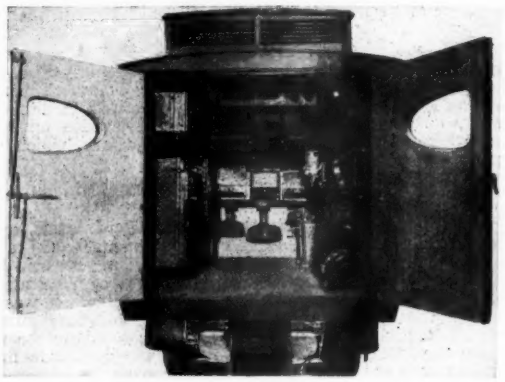
Publications of the Technical Section of the Association of Engineering and Shipbuilding Draughtsmen.—"Press Tools." By N. F. Tieldsend. Price 2s.

"Vibration Problems in Engineering." By S. Timoshenko. Pp. vi+351; figs. 165. London: Constable & Co., Ltd. Price 21s. net.

"Science Abstracts" (A & B). Vol. XXXII. Part 4. April, 1929. London: E. & F. N. Spon, Ltd. Price 3s. each.

## A Travelling Exhibition.

A completely-equipped demonstration van is the latest addition to the "selling staff" of VERITYS, LTD., Aston, Birmingham. The body of the van has been specially designed and built with a well-ventilated roof, fitted with glass side panels, enabling a complete inspection to be made of a wide range of the company's productions. The accompanying illustration of the interior shows an exhibit of "Aston" motor-starting gear, "Maxlume" lighting equipment and radiators, electric



Veritys' Demonstration Van.

fans, &c. These are mounted on adjustable angle iron frames and staged on shelves, and are easily changed and replaced as occasion demands. The exterior is finished in a rich chocolate colour with a cream panel. The van will operate from the various branch offices and demonstrations by a trained staff will be given to electrical contractors and users of electrical apparatus throughout the country.

## New French Companies.

Among the concerns recently formed in France are the Société Française d'Accumulateurs Electriques, Paris (12, Rue d'Aguessau), capital 7½ million francs; La Société Industrielle et Commerciale de la Dronne, Paris (39, Rue Vivienne), capital 600,000 fr., to operate a hydro-electric power station on the Dronne at Bourg-du-Bost (Dordogne); and La Société des Câbleries d'Epinay, Paris (18, Rue Duphot), capital 500,000 fr.

## Another Industrial Conference.

In London last week representatives of the Federation of British Industries, the National Confederation of Employers' Organisations, and the General Council of the Trades Union Congress met to discuss means of promoting peace in industry. After a lengthy sitting it was decided to form a joint committee of the three bodies "to examine the best methods for consultation and co-operation between the three organisations and to report to a further meeting of the conference."

The General Council of the Trades Union Congress at its monthly meeting on April 24th instructed its representative to prepare a full report of the proceedings to be considered at a later meeting. The Labour Correspondent of *The Times*, in commenting upon the matter, says that the General Council has to consider, among other things, the effect of any arrangement with the organisations upon the Melchett-Turner conference. The main purpose of the latter was to prove the possibility of negotiations on the largest scale and the widest range of subjects between employers and trade unionists. At the outset there was a clear understanding that the employers associated with Lord Melchett were acting as individuals and not representatives, and that, although their influence was great, they could commit none but themselves. Such a conference could point the way to co-operation and show, by example, the kind of agreements into which employers and trade unionists could enter with the object of promoting the welfare of industry and thereby the welfare of those employed in industry. But the employers engaged in those discussions were, of course, unable to take operative decisions. Official negotiations on the same lines with the employers' organisations would necessarily supersede the work of the Melchett-Turner conference, which would by then have served its purpose.

## New Indian Company.

The Berhampur Electric Supply Co. is the name of a new concern which has been formed at Berhampur, Bengal, with a capital of 300,000 rupees, to undertake the supply of electricity in that town.

## New Zealand Electrical Imports.

The *Board of Trade Journal* reports that during the last quarter of 1928 electrical apparatus and appliances valued at £522,810 were imported by New Zealand, being the second largest class of imports. The bulk of the goods (£318,634) came from the United Kingdom, while the United States share was valued at £80,361, Canada's at £35,686 and Australia's at £8,521.

## A British Exhibition in Buenos Aires.

A leaflet accompanying the April *Review* of the Bank of London and South America states that a British Trade Exhibition, already in active preparation, will be held in Buenos Aires at the end of next year. The Exhibition, promoted under the auspices of the British Chamber of Commerce in the Argentine Republic, has the support of the British-owned banks, railways, public utility companies, and commercial undertakings generally in that country; the guarantee fund to date exceeds £50,000. The magnificent grounds and buildings of the Argentine Rural Society have been lent to the Chamber of Commerce for the purposes of the Exhibition. The period of the Exhibition will be for some eight weeks during the Argentine summer of 1930-31. While no doubt the bulk of the visitors will be Argentine, many, especially those with trade interests, will be attracted from the neighbouring countries in South America. Communications and inquiries regarding the Exhibition should be addressed to: The Secretary, Buenos Aires British Empire Trade Exhibition, 5, Parliament Mansions, Victoria Street, S.W.1.

## New Egyptian Company.

A newly-formed company, known as the Société Egyptienne d'Electricité, is reported to be preparing plans for the erection of a large new power station near Cairo.

## Bankruptcy Proceedings.

MABEL WOOLLDRIDGE, lately trading as The Woolldridge Radio Co., 26-39, Lisle Street, W.C.—At the London Bankruptcy Court, on April 23rd, Mr. Registrar Mellor conducted the public examination of this debtor, who failed last October with total liabilities of £362 (unsecured £332) and assets "nil." Replying to the Official Receiver, debtor stated that in 1923, with £30 capital, she commenced trading in equal partnership at 39, Lisle Street with a man named Hawkins as wireless dealers under the style of "S. Hawkins," but the venture proved unsuccessful; in 1924 her partner withdrew from the business, which she continued on her own account until the end of 1925, when she disposed of the stock and ceased to trade. In about May, 1926, with £100 (borrowed money) she, with another, commenced trading in equal partnership as wireless dealers under the style of "The Woolldridge Radio Company." In November, 1926, the business was acquired by a limited liability company, of which she was appointed a director, and was allotted 50 shares of £1 each; the company effected little business, and in August, 1928, a receiver was appointed by a creditor. Early in 1927 she commenced trading as a wireless dealer on her own account and in her own name at 22, Lisle Street; on May 9th, 1927, M. Woolldridge (Wireless), Ltd., was registered with a nominal capital of £1,500, and acquired her business; she was appointed a director of the company, which appointment she still retained. The debtor attributed her failure to legal costs and the collapse of two limited companies in which she was interested. The examination was concluded.

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K. P. J. JOLIVARD (trading as K. Jolivard & Co.), electrical engineer, 66, Victoria Street, S.W.1.—The public examination of this debtor was held on April 26th at the London Bankruptcy Court before Mr. Registrar Francke, the accounts showing liabilities of £1,486 against assets valued at £85. Replying to Mr. Wheeler, Assistant Official Receiver, the debtor stated that prior to June, 1924, he was in employment. He then started business without capital; the trading was successful until 1927, but subsequently gradually declined. Owing to keen competition and pressure by creditors he discontinued the business in July, 1928, and had since been without occupation. Lack of capital was a further cause of the failure. The examination was concluded. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Baxter & Caunter, Ltd. | 85 | Marian Harris (Miss) | 230 |
| Engineering & Lighting Equipment Co., Ltd. | 38 | Newquay Electric Light and Power Co., Ltd. | 35 |
| Falk, Stadelmann & Co., Ltd. | 32 | P. W. Rawes | 493 |
| R. Foote | 68 | W. Sanders | 23 |
| General Electric Light Co. | 24 | C. F. Tucker | 150 |
| | | Yesley Electric Supplies, Ltd. | 25 |

G. A. NORMAN, electrical engineer, 11, Freeman's Yard, Barnsley.—Last day for proofs for dividend, May 8th. Trustee, Mr. B. S. Briggs, Official Receiver, County Chambers, King Street, Wakefield.

J. WESTNUTT, electrical engineer, High Street North, Dunstable.—Last day for proofs for dividend May 7th. Trustee, Mr. A. J. Rogers, Official Receiver, The Parade, Northampton.

R. BENNETT, wireless dealer, 107, Devons Road, Bow, E.—Receiving order made April 23rd, on a creditor's petition. First meeting, May 6th; public examination, June 5th, both at Carey Street, W.C.

W. M. HORSFALL, electrical engineer, 7, Redcross Street, Liverpool.—Last day for proofs for dividend, May 11th. Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool.

B. H. WISHAW, electrical and wireless engineer, Bakewell Road, Matlock.—Last day for proofs for dividend, May 11th. Trustee, Mr. L. A. West, Official Receiver, 22, Regent Street, Park Row, Nottingham.

## Company Liquidations.

WILLIAM ALLAN & CO. (LIVERPOOL), LTD., 62, Dale Street, Liverpool, electrical factors.—A meeting of creditors was held on April 25th at Liverpool, Mr. J. Airey, who represented some of the principal creditors, presiding. The liquidators submitted a statement of affairs which showed ranking liabilities of £5,187, of which £5,111 was due to the trade, and net assets of £2,952, leaving a deficiency, so far as the creditors were concerned, of £2,235. It was reported that the company was registered in January, 1928, with a nominal capital of £3,000, of which £2,000 had been issued, and was fully paid. Shares to the value of £1,500 were issued for cash, and the balance were allotted for consideration other than cash. The deficiency, so far as the shareholders were concerned, was therefore £4,235, which was accounted for by losses on trading totalling approximately £2,800, and the depreciation of the assets. Voluntary liquidation was decided upon as proceedings had been commenced by certain creditors. During the year to December 31st last the sales were £16,420, with a gross profit of £1,180. The expenses, however, totalled £3,479, and there was a net loss of £2,299. During the current year the sales had been £3,347, with a gross profit of £167, and a net loss of £538. During the discussion it was stated that one of the two liquidators had been a director of the company. A resolution was passed in favour of an application being made to the Court for the appointment of Mr. J. Airey as liquidator, together with a committee of inspection consisting of Mr. P. S. Booth, Liverpool, and the representatives of Siemens Electric Lamps & Supplies, Ltd., and Ferranti, Ltd. The principal creditors are:—

| | £ | | £ |
|---|---|---|---|
| Philips Lamps, Ltd. | 387 | McMichael, L., Ltd. | 183 |
| Pye, W. G., & Co. | 283 | Mullard Wireless Service Co., Ltd. | 175 |
| General Electric Co., Ltd. | 361 | Ferodo, Ltd. | 169 |
| Siemens Electric Lamps and Supplies, Ltd. | 790 | Watson, W., & Co., Ltd. | 105 |
| Cossor, A. C., Ltd. | 295 | Marconiphone Co., Ltd. | 102 |
| Ferranti, Ltd. | 237 | | |

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BEDALE AND DISTRICT ELECTRIC SUPPLY CO., LTD.—A meeting of members is called for May 31st at the Electric Power Station, Bedale, to hear an account of the winding up from the liquidator, Mr. R. W. Smith.

## Dissolution of Partnership.

HAVIL MOTOR CO., automobile, electrical and radio engineers, battery repairing and recharging depôt, dealers in wireless accessories, &c., 30, High Street, Peckham, S.E., and Havil Street, Camberwell, S.E.—Messrs. W. H. BUTCHER, G. P. HALL and J. A. PHILLIPS have dissolved partnership. Mr. Phillips will attend to debts and continue the business.

## Polish Foreign Electrical Trade.

During February last the value of "apparatus, conductors and other electrotechnical materials" imported into Poland was 8,558,000 zloty (about £198,000). Poland's exports of the same class were valued at 95,000 zloty (about £2,200).

## Proposed Belgian Radio Exhibition.

For the past two years radio manufacturers and traders in Belgium have had a section in the annual Motor and Cycle Show in Brussels in December. This not having proved altogether satisfactory, the two Belgian radio trade associations—the Bourse du Matériel Electrique and the Chambre Syndicale de la T.S.F.—have decided to organise a purely radio exhibition at a more suitable period of the year. The exact date and locality have not yet been settled.

## The Next Illumination Design Course.

We have received the preliminary programme for the nineteenth Illumination Design Course which is being organised by the E.L.M.A. Lighting Service Bureau, and will be held from June 10th to 14th next. The course will be new in many ways, and will include a number of subjects not dealt with in previous courses. In addition to this the Lighting Service Bureau has been to a great extent redesigned, and consequently greater facilities are available for the demonstrations accompanying the lectures.

## West Indian Electrical Imports.

In an appendix to a report by Mr. J. Paterson, of the Trade Commissioner's Office, Trinidad, upon economic and financial conditions in the British West Indies and contiguous territories, some particulars of electrical apparatus imports are given. The principal market for this class of goods is Jamaica, whose imports rose in value from £39,059 in 1926 to £39,111 in 1927. The largest supplier was the United States whose share was £33,058 in 1926 and £21,902 in 1927. The United Kingdom's share rose from £4,952 to £16,049. Canada supplied goods valued at £237 in 1927. Trinidad and Tobago imported £32,859 worth of electrical apparatus in 1927, as compared with £24,030 in 1926. Here, again, the United States was the largest supplier, with a value of £14,699 in 1926 and £20,248 in 1927. Imports from the United Kingdom increased from £6,227 to £9,525, and Canada was credited with about £2,000 in each year. British Guiana's imports had a total value of £5,733 in 1926 and £9,153 in 1927. The United King-

dom's share rose from £1,041 to £4,302, and that of the United States from £3,661 to £4,207. The totals shown for Barbados are £8,176 in 1926 and £11,752 in 1927, of which the United States supplied £4,571 and £7,067, respectively, and the United Kingdom £2,925 and £4,080. The report is published by the Stationery Office for the Department of Overseas Trade at 2s. 6d. net.

### Foreign Trade Advice.

In the April *Bulletin* of the British Chamber of Commerce in Paris there appear the following "Byewords for the conduct of British trade abroad" which are appropriate at a time when salesmanship in foreign markets is the subject of much discussion:—(1) Teach your boys one or more foreign languages, but teach them at an early age, and thoroughly. (2) Send your young men abroad for study and for commercial training. (3) Study the requirements of foreign markets and make your goods to suit them. (4) Employ British travellers speaking your prospective customer's language in preference to soliciting by post. (5) Quote your customers in the weights and measures and currency of their country. (6) Quote for your goods delivered at your customer's door. Shipping agents will invariably quote free delivery, duty and all charges prepaid. (7) Your catalogues should be printed in your customer's language. (8) Endeavour to meet your customer's requirements from the point of view of credit. (9) Correspond with your customers in their own language and not in your own. (10) Help to maintain the high standard of British commercial integrity. (11) Make use, through your travellers and by correspondence, of our Commercial Attachés and Consuls and also British Chambers of Commerce abroad, who are able to help your business in very many ways.

### New Catalogues and Lists.

Messrs. S. G. BROWN, LTD., Western Avenue, North Acton, W.3.—The "Brown Budget" for April containing interesting illustrated articles on the company's loud speakers, electro-megaphones, &c. One on the use of loud-speaker equipment at election meetings is topical.

MESSRS. PERRY, BEVAN & Co., LTD., Priory Road, Aston, Birmingham.—A folder containing illustrations, particulars and prices of "Priory" electric fires, including bowl and screen patterns.

MESSRS. W. C. DAVEY & Co., 27, Mortimer Street, Tottenham Court Road, W.C.1.—A leaflet advertising the "Hush-a-Phone" telephone attachment which eliminates overhearing.

MESSRS. ERNST B. WESTMAN, LTD., 39, Lombard Street, E.C.3.—An illustrated booklet dealing with Swedish charcoal iron.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—Booklet No. 413 illustrating and describing "Philiray" reflectors for shop-window lighting. Priced.

MESSRS. BRUCE PEEBLES & Co., LTD., Edinburgh.—Leaflet No. 171, describing the electrical equipment of a stone quarry in Scotland. Illustrated.

MR. G. MARSHMAN, Trinity Street Works, Bury, Lancs.—A leaflet containing an illustration and particulars of the "Two-Twelve" electrically-heated boiler.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—List W6117, containing exhaustive details, illustrations, &c., of the company's "Type BEM.1" h.t. supply unit for a.c. mains.

X-RAYS, LTD.—*Correction*: In our issue of April 19th (p. 699) we inadvertently gave this company's address as 47, Red Lion *Square;* this should have been 47, Red Lion *Street*, W.C.1.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, S.W.1.—A postcard illustrating one of the West End traffic signs and calling attention to the fact that these are equipped with "Venner" time switches.

Messrs. S. G. LEACH & Co., LTD., 26-30, Artillery Lane, E.1.—A comprehensive illustrated catalogue dealing with high-pressure insulators and describing manufacturing processes.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—Folder No. 4150/5, containing an illustrated description of the "Cadillac" portable electric blower for cleaning machinery. Priced.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—Price List 49/1, illustrating and describing the company's a.c. automatic gate-end circuit-breaker. Priced.

MESSRS. GRIERSON, LTD., 4, Bloomsbury Place, W.C.1.—A brochure describing very fully the "Dulrae" electric panel warming system, with particulars of running costs, &c.

THE NELSON ELECTRIC CO., LTD., 138, Kingston Road, Merton Park.—A leaflet containing prices of the company's lamps.

MESSRS. RICHARD JOHNSON, CLAPHAM & MORRIS, LTD., Jacem House, Trafford Park, Manchester.—Illustrated price lists of lighting glassware, vacuum cleaners, gramophones, and portable radio sets.

THE RADIO COMMUNICATION CO., LTD., 34-35, Norfolk Street, Strand, W.C.2.—List X329, containing an illustrated description of the "Type R.A.76" direction-finder equipment for the navigation of ships.

CELESTION, LTD., Kingston-on-Thames.—An illustrated leaflet advertising a new loud speaker for portable sets.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Two coloured prints illustrating "Marconi" valve window displays for the use of dealers.

MESSRS. BLAGG & JOHNSON, LTD., Newark-upon-Trent.—A booklet illustrating many examples of the company's sheet metal work, including air ducts, ventilators, air washers, &c.

THE AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Strowger Works, Liverpool.—A fully-illustrated brochure upon the company's fire alarm apparatus—closed and open circuit systems and firemen's call-bell system.

### Employment during March.

The April *Ministry of Labour Gazette* states that employment in the engineering industry during March was quiet on the whole, but showed a general improvement. In electrical engineering employment remained fairly good, although there was no change as compared with March last year. The statistics show that at March 25th the number of unemployed in the engineering industry as a whole was 79,417, the proportion decreasing from 9.3 per cent. in February to 8.1 per cent. In the electrical engineering section the total was 6,228, and the proportion was 4.7 per cent. (against 5.4 per cent.). There was a rise to 1,249 in the number of unemployed in the electrical wiring and contracting industry, the proportion increasing from 7.7 to 8.0 per cent. The electrical cable, wire and lamp manufacturing group reported an improvement. The number of unemployed fell to 5,190, and the proportion from 6.5 to 6.0 per cent.

### Unemployment.

The Ministry of Labour returns show that there was a decrease of 24,570 in the number of unemployed during the week ended April 15th. The total at that date was 1,153,500, as compared with 1,178,070 on April 8th, and 1,083,774 on April 16th, 1928.

### Trade Announcements.

The London office of Messrs. CONNOLLYS (BLACKLEY), LTD., has been removed to Oswaldestre House, Norfolk Street, W.C.2. Telephone: Central 9722; telegrams: "Syllonnoc Estrand London."

Mr. N. F. BADLEY, London agent of the Metropolitan Electric Cable & Construction Co., Ltd., is now also acting as London agent for Mr. Geo. P. Cosway, Nuneaton, manufacturer of joint boxes and cable requisites.

Messrs. BRAYSHAW, electrical contractors, Cotton Street, Bolsover, have opened new showroom premises at Devonshire House, Holywell Street, Chesterfield.

The ENGLISH STEEL CORPORATION, LTD., Openshaw, Manchester, has taken over the commercial manufacturing businesses hitherto carried on by Vickers-Armstrongs, Ltd. (River Don, Openshaw and Elswick Works), and Cammell Laird and Co., Ltd. (Cyclops, Grimesthorpe and Penistone Works).

BAKELITE, LTD., 68, Victoria Street, S.W.1, has acquired the business of the Ideal Manufacturing Co., Sparkbrook, Birmingham, as from April 1st, 1929. Mr. F. A. Cook, manager of the Ideal Co., has joined the staff of Bakelite, Ltd., and all other employés have been taken over.

Messrs. BOUGHEY & POWELL, 18-24, Baldwin Street, Bristol, have been appointed agents of the Credenda Conduits Co., Ltd., for the Bristol and South-West England area. They carry stocks and have a showroom.

Messrs. TURNER BROS., 134, Upper Thames Street, E.C., inform us their telephone number is now: Mansion House 9355.

### Patent Restoration.

An order has been made restoring patent No. 214,274 of April, 1923, granted to J. R. Robertson for "Improvements in apparatus for recording and reproducing sound."

### Hungarian Electrical Imports.

According to a Budapest correspondent of *The Times Trade and Engineering Supplement* the value of electrical machinery and appliances imported into Hungary during 1928 was 21,300,000 pengos (about £760,000). This was a continuance of a steady advance, the values in the two preceding years being: 1926, 13,100,000 pengos (£468,000); 1927, 9,900,000 pengos (£350,000).

### The E.D.A. and the Election.

The British Electrical Development Association has entered politics with a poster instructing the women of the country how to vote. The policy for which their suffrages are solicited is "Electricity in Every Home." The poster, which measures about 30 in. by 20 in., is obtainable in quantities at a reasonable price.

### A Gift to an Infirmary.

Mr. W. H. J. Ryder, North Shields, recently presented to the Tynemouth Jubilee Infirmary a radio set for the entertainment of the patients and staff. The set, which has 70 headphones and six loud speakers, is of the "Met-Vick" "All-Electric" 5-valve type with volume controls provided where required, and it operates off a 240-V a.c. supply.

### Lift Electricians' Wages.

Arising out of the recent strike of London electricians a conference was held on April 26th between representatives of the Engineering and Allied Employers' Federation and the Electrical Trades Union. The Union put forward a claim for an increase in the wages of men engaged on electrical work in connection with lift installations, but as it was decided that the views of the Amalgamated Engineering Union on the matter would have to be obtained, the conference was postponed indefinitely until an understanding between the two unions was reached.

## "Mazda" Lamp Depôts.

The BRITISH THOMSON-HOUSTON CO., LTD., is opening, throughout the country, numerous additional "Mazda" lamp stores to enable traders in towns at a distance from the principal branch offices and stores to obtain supplies more quickly. In the last few weeks depôts have been established in Edinburgh and Nottingham, and now others have been opened in Blackburn and Norwich. The new Blackburn stores in Old Bank Street, King Street, is associated with the Manchester branch of the company. The telephone number is "Blackburn 7093." The Norwich stores address is Cambridge House, 26, Tombland, and the telephone number "Norwich 2541." The telegraphic address for both depôts is "Asteroidal." A depôt will be opened in Derby shortly.

## The Economic Mission to Australia.

In our issue of January 18th (p. 121) we summarised the conclusions and recommendations of the British Economic Mission to Australia (Sir Arthur Duckham, Sir Hugo Hirst, Bt., Sir Ernest Clark, and Mr. D. O. Malcolm). The full report has now been published by the Stationery Office at 2s. 6d. net. It comprises a broad and interesting survey of the many phases of Australian activity—financial, agricultural, and financial, among others—and discloses an independence of view which should lead to the acceptance of the Mission's recommendations by the Commonwealth and State Governments.

## Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

| | CHEMICALS, &c. | Price April 20th. | Fortnight's inc or dec. |
|---|---|---|---|
| a | Acid, Oxalic ... ... ... ... | per lb. | 5¾d. | ... |
| a | Ammoniac, Sal ... ... ... | per ton. | £60 | ... |
| a | Ammonia, Muriate (large crystal) | ,, | £52 | ... |
| a | Bisulphide of Carbon ... ... | ,, | ... | ... |
| a | Borax ... ... ... ... | ,, | £25 | ... |
| a | Copper Sulphate ... ... ... | ,, | £25 10s. | ... |
| a | Potash, Chlorate ... ... ... | per lb. | 9½d. to 4d. | ... |
| a | ,, Perchlorate ... ... | ,, | 5½d. | ... |
| a | Shellac ... ... ... ... | per cwt. | £18 10s. | ... |
| a | Sulphur, Commercial ... ... | ,, | £11 | ... |
| a | ,, Roll ... ... ... | ,, | £11 | ... |
| a | Soda, Chlorate ... ... ... | per lb. | 3d. | ... |
| a | ,, Crystals ... ... ... | per ton. | £5 to £5 5s. | ... |
| a | Sodium Bichromate, casks ... | per lb. | 3½d. | ... |
| | METALS, &c. | | | |
| b | Aluminium, Ingots ... ... | per ton. | £95 to £100 | ... |
| b | ,, Wire ... ... ... | per lb. | 1/1 to 1/9 | ... |
| b | ,, Sheet ... ... ... | ,, | 1/1 to 2/9 | ... |
| p | Babbitts Metal and Anti-friction Metal— | | | |
| | Grade I ... ... ... | per ton net. | £182 | £6 dec. |
| | Grade II ... ... ... ... | ,, ,, | £128 | £4 dec. |
| | Grade III ... ... ... ... | ,, ,, | £71 | £3 dec. |
| e | Brass (rolled metal 2" to 12" basis) | per lb. | 1/ ¾d. | ½d. dec. |
| e | ,, Tubes (solid drawn) ... ... | ,, | 1/1 to 1/1½d. | ½d. dec. |
| e | ,, Wire, basis ... ... ... | ,, | 11½ | ½d. dec. |
| c | Copper Tubes (solid drawn) ... | ,, | 1 8½ | ½d. dec. |
| c | ,, Bars (best selected) ... | per ton. | £112 | £7 dec. |
| c | ,, Sheet ... ... ... | ,, | £111 | £7 dec. |
| c | ,, Rod ... ... ... ... | ,, | £1 2 | £7 dec. |
| d | ,, (Electrolytic) Bars ... | ,, | £84 | £5 dec. |
| d | ,, ,, Sheets ... | ,, | £142 10s. | ... |
| d | ,, ,, Wire Rods ... | ,, | £94 | £5 dec. |
| d | ,, ,, H.C. Wire | per lb. | 11½ | ½d. dec. |
| f | Ebonite Rod ... ... ... ... | ,, | 2/8 to 2/6 | ... |
| f | ,, Sheet ... ... ... ... | ,, | 2/8 to 2/6 | ... |
| n | German Silver Wire ... ... | ,, | 2/2 | ... |
| h | Gutta-percha, fine ... ... ... | ,, | nom. | ... |
| h | India rubber, Para fine ... ... | ,, | 9½d. | 2½d. dec. |
| l | Iron Pig (Cleveland No. 3.) ... | per ton. | 68/6 | ... |
| l | ,, Wire, galv. No. 8, P.O. qual. | ,, | £21 | ... |
| g | Lead, English pig ... ... ... | ,, | £24 | 5/- inc. |
| g | Mercury ... ... ... ... | per bot. | £22 2s. 6d. to £22 5s. | ... |
| e | Mica (in original cases) small ... | per lb. | 3d. to 3/- | ... |
| e | ,, ,, medium ... | ,, | 4/- to 8/- | ... |
| e | ,, ,, large ... | ,, | 10/- to 20/- & up | ... |
| p | Phosphor Bronze, plane castings | ,, | 1/3½ | ... |
| p | ,, ,, drawn bars & rods | ,, | 1/5½ | ... |
| p | ,, ,, rolled strip & sheet | ,, | 1/4½ | ... |
| p | ,, ,, wire... ... ... | ,, | 1/7½ | ... |
| o | Platinum ... ... ... ... | per oz. | £13 17s. 6d. | ... |
| d | Silicium Bronze Wire ... ... | per lb. | 1/3 | ... |
| r | Steel, Magnet, in bars ... ... | ,, | 7½d. | ... |
| n | Tin, Block (English) ... ... | per ton. | £198 5s. to £198 15s. | £6 15s. to £7 dec. |
| n | ,, Wire, Nos. 1 to 16 ... ... | per lb. | 3/11 | ... |

*For 1 cwt. lots. Special quotations against definite specifications.

**Quotations supplied by**

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
W. F. Dennis & Co.

Writing on April 27th, Messrs. James Forster & Co. stated that the lead market opened on Monday (April 22nd) a little firmer, but thereafter prices lost ground daily. The backwardation has also contracted slightly. There are no signs yet of any revival in demand from consumers. Arrivals during May are expected to be light, unless additional supplies are forthcoming from Mexico, and this, now that the troubles there appear to be over, is not outside the bounds of possibility. The future depends very much on how long consumers can hold off the market. If present conditions last much longer lower prices are inevitable.

## Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-Making Industry notifies us that the recent increase in the wages of London electricians will affect the wages of plumber-jointers and their mates in the Greater London Area. The new rates, which will take effect on the first pay day in May for the period covered by that pay day, will be as follows:—Plumber-jointers, 1s. 10½d. per hour; plumber-jointers' mates, 1s. 6¼d. per hour. The rates will remain in operation for a period of six months.

## For Sale.

Birmingham Corporation invites offers for one 2,500-h.p. engine with a 1,500/1,875-kW generator and auxiliary plant. The Transport Department of Coventry City Council has for sale two 150-i.h.p. steam engines, each direct coupled to a 100-kW generator, and one 25-i.h.p. steam engine direct coupled to a 17-kW generator, complete with switchboard. (See our advertisement pages to-day.)

## Recent Contracts.

Among the contracts recently secured by VICKERS-ARMSTRONGS, LTD., are one from Lever Bros., Ltd., for the hydraulic equipment for the entrance lock of their new dock at Bromborough, and orders for six hydraulic capstans for the Calcutta Port Commissioners, and two electrical capstans for the East Indian Railway.

## Change of Address.

Mr. S. T. Allen, Central England Engineer to the Central Electricity Board, informs us that on and after May 6th the permanent offices of the Central England Area will be at 53, Wake Green Road, Moseley, Birmingham.

# Lighting and Power Notes.

**Australia.**—VICTORIA.—The *Melbourne Age* reports that prolonged negotiations regarding the future source of electricity supply for Ballarat and Bendigo were recently completed, when it was announced that the Government had approved the purchase by the Electricity Commission of the electricity and tramway undertakings in Ballarat and Bendigo of the Electric Supply Company of Victoria, Ltd. The purchase price was £272,000, to be paid to the company on June 30th, 1934.

**Ayrshire.**—ELECTRICAL DEVELOPMENT.—The Ayrshire Electricity Board is to make application for consent to the construction of an overhead line to supply the village of Fairlie. The village is dependent on oil as an illuminant. The Central Board has quoted terms for a bulk supply to Skelmorlie, and if these are accepted it will proceed with the construction of the necessary transmission line from Greenock to Skelmorlie. The Board also states that it is anxious to proceed with the development of electricity supply at Wemyss Bay and Inverkip.

**Bedford.**—MAINS EXTENSION.—The Corporation Electricity Committee reports that, to meet an increased demand by the London Brick Company and Forders, Ltd., and for the purposes of a general supply to the intervening rural area, it proposes that the 3 phase main from the generating station to the Cryselco Lamp Works be extended to Wootton Pillinge. The proposal provides for the erection of an 11,000-V overhead line, with the necessary transformers, switchgear, &c., at an estimated cost of £4,900.

SUPPLY TO RURAL AREAS.—The Committee recommends that a supply of electricity be provided for the villages of Clophill, Maulden and Ridgmont, at an estimated cost of £5,000.

**Birmingham.**—YEAR'S WORKING.—At a recent meeting of the Corporation Electric Supply Committee it was reported that the sales of electricity during the past year showed an increase of 33½ million kWh, or 12 per cent., as compared with the previous year. The total sales amounted to 314½ million kWh. The gross revenue of the undertaking was £1,700,000, an increase of £121,000. During the past year 11,000 consumers were added to the system.

**Blackpool.**—YEAR'S WORKING.—The annual report of the Corporation Electricity Department for last municipal year shows a total output of 37,931,906 kWh (an increase of 4,295,546 kWh over the previous year). Less than half the supply was generated at Blackpool, over 19½ million kWh being purchased in bulk from Preston.

**Canada.**—HYDRO-ELECTRIC SCHEME.—The Winnipeg correspondent of the *Financial Times* reports that British financiers there are seeking to conduct negotiations with the Government for the development of a 300,000-h.p. hydro-electric scheme on a site on Nelson River, situated in the heart of the northern mineral district where mining developments assure smelting and concentrating and possibly pulp and paper projects in the near future. The group seeks priority rights during the

examination of the site, and, if satisfactory, the development of a $6,000,000 initial scheme of 80,000 h.p. is probable.

**Continental.**—Russia.—Good progress is being made with the construction of the Dnieprostrag hydro-electric power station which is being erected between Ekaterinoslav and Steporoshje to utilise the water power of the River Dnieper. The work, which is not expected to be fully completed until 1932, includes the construction of a dam 2,492 ft. in length and about 121 ft. in height. The installation will comprise seven turbo-generators, each of 35,000 kW, and the power generated will be transmitted at 100,000 V, a distance of about 60 miles.

A scheme is reported to be under consideration for the establishment of a hydro-electric station to utilise the water power of the River Msta, near Novgorod, for the supply of electricity to the Leningrad district. It is stated that over 200,000 h.p. is available.

Germany.—Plans are being prepared for the erection of a 45,000-kW hydro-electric station to utilise the power of the River Nordeifel, near Heimbach-an-der-Ruhr, in the Aix-la-Chapelle district.

Bulgaria.—A commission has studied the problem of supplying most of the towns in Bulgaria with electricity, and has drawn up a detailed programme for presentation to the Government. It is found that the cheapest hydro-electric power is supplied by joint stock companies (average 5.80 leva per kWh), followed by water power syndicates (7 leva per kWh), municipalities (7.80 leva), co-operative societies (8 leva), and people's banks (9.80 leva). There are at present in Bulgaria 36 hydro-electric stations, 24 steam stations, and 107 small stations with Diesel engines. These installations supply 65,300,000 kWh, or 12 kWh *per capita* of the population of Bulgaria.—*Reuter's Trade Service* (Sofia).

**Cornwall.**—Electrical Development.—Good progress is being made with the electrification of Cornwall, the latest scheme to be sanctioned embracing three boroughs and 44 districts in the western area. The Special Order which has been secured by the West Cornwall Electricity Supply Co., Ltd., schedules the boroughs of Helston, St. Ives and Penryn, the urban districts of St. Just, Madron, Paul, Ludgvan, Hayle, Phillack, Padstow and Weybridge, the rural districts of West Penwith, Helston, East Kerrier, Truro and St. Columb Major, and part of the rural district of Redruth. It is explained by an official of the company that it is hoped to complete the entire scheme in two years. Newlyn and Helston have already been supplied, and it is expected to connect St. Erth, Marazion, Porthleven, Goldsithney, Breage, Hayle and Copperhouse this year, and possibly St. Just.

**Faversham.**—Electricity Supply.—It was reported to the Town Council on April 16th that it would be necessary to increase the supply of electricity before the autumn as, even in the absence of a breakdown, the existing plant would not in December be able to meet the needs of consumers. The Electricity Supply Sub-Committee had discussed the alternatives of installing additional plant, if permitted, or of opening fresh negotiations with the Kent Electric Power Co. for a supplementary supply, and the Council decided that a deputation should interview the Electricity Commissioners in order to explain the position.

**Forres.**—Electricity Agreement.—The Town Council has concluded an agreement with the Grampian Electricity Supply Co., Ltd., for the introduction of an electricity supply.

**Glasgow.**—Bulk Supply.—The manager having reported that the Central Electricity Board had offered to give a supply of electricity at Port-Dundas, in addition to Dalmarnock, the Corporation Electricity Committee has recommended that a supply be taken at Port-Dundas, on condition that should the Corporation at any time find that the taking of a supply there involves greater expense than would have been the case if it laid its own transmission lines, the Board will make such adjustments in the rates as will make the expense to the Corporation not greater than the cost of taking the whole supply at Dalmarnock and laying the necessary transmission mains, or, alternatively, that the Corporation may lay such transmission lines at any time it thinks fit, and take the whole supply at Dalmarnock, and, further, that, as the period of changing the frequency will necessitate the running of obsolete plant at Port Dundas, the Board will pay the amount which exceeds that which would have been incurred had Dalmarnock only been run.

**Grimsby.**—Loan.—The Corporation Electricity Committee is applying for sanction to a loan of £29,490 for the provision of new feeders, mains, services, &c.

**Irish Free State.**—The Shannon Scheme.—The number of transformer stations now completed in the Leinster loop, in connection with the Shannon scheme, totals 16, and they have been handed over to the control of the Electricity Supply Board by the Ministry for Industry and Commerce. They are the first sections of the scheme to be completed and given to the Board to operate. The temporary station at Inchicore, Dublin, has also been handed over. The transformer stations are situated in the following centres: Waterford, Kilkenny, Wicklow, Wexford, Kildare, Naas, Maryborough, Athy, Carlow, Ballyhale, New Ross, Gorey, Enniscorthy, Arklow, Deansgrange, and Bray.

**Lancashire.**—Electric/l Development.—The Mersey Power Company has in hand a large programme of extensions, which includes a line from Runcorn through Halton, Norton, Daresbury and Hatton to Stretton. At Norton, Moore and Daresbury, sub-stations and distribution systems will be established. When the scheme is extended to Preston Brook, the lighting charge will not exceed 8d. per kWh, and the power charge for small consumers 2d. per kWh.

**London.**—Battersea.—The Borough Council Electricity Committee has received sanction to the borrowing of £200,831 for extensions to the generating station.

St. Marylebone.—The Finance Committee has reported to the Borough Council that sanction has been received to a loan of £115,652 for cables, switchgear and transformers.

Poplar.—The Electricity Committee is seeking sanction to borrow £2,750 for cable extensions at West India Docks and £2,023 for cable extension from the Wick Lane sub-station.

**Porthcawl.**—Electricity Supply.—In connection with the Urban District Council's application for sanction to a loan of £23,000 to provide an electricity supply for the district, the Electricity Commissioners have informed the Council that, owing to its financial position, they are unable to sanction the loan. The Council has therefore decided to open negotiations with private companies, individuals, and other authorities with a view to obtaining a supply.

**Southend-on-Sea.**—Loan.—The Town Council has applied for sanction to a loan of £48,516 for e.h.p. ring mains, in connection with the a.c. distribution scheme in the north-eastern, north-western, and western areas of the borough. A partial supply in bulk is to be taken from the County of London Electric Supply Co., Ltd.

**Special Orders.**—Application has been made to the Electricity Commissioners for a Special Order by Mr. J. L. H. Williams, authorising him to supply electricity in the borough of Haverfordwest.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Derbyshire and Nottinghamshire Electric Power Co. to supply electricity in the rural district of Misterton.

The following Special Orders made by the Commissioners have been confirmed by the Minister of Transport: Glaslyn and Deudraeth Rural Districts; Warmley; Peacehaven; Culm Valley; Manchester Electricity (Extension); North Somerset Electricity (Extension); Tonbridge Electricity (Extension); Brentwood and District Electricity (Extension, &c.); and Liskeard.

**Stretford.**—"All-in" Tariff.—In dealing with this tariff in our last issue (p. 744) we gave the minimum net ratable value for the purpose of the scheme as £100. This should, of course, have been £10.

**Tilbury.**—Loans.—The Urban District Council has applied for sanction to the borrowing of £5,000 for mains and services, £750 for plant, £4,200 for domestic apparatus, and £2,350 for wiring installations.

**Truro.**—Inquiry.—An inquiry was held by Mr. F. Gordon Tucker on behalf of the Ministry of Transport on April 25th, into the application made by the Truro Electricity Supply Company for authority to use wooden poles in connection with the distribution of electricity. The application was opposed by the Corporation. For the company Mr. L. A. Hards said it was opposed to the use of steel poles because it considered that wood would be far more satisfactory. Steel poles had been used in various parts of the county, and it was found that unless they were extraordinarily strong, they bent directly they carried any amount of copper on them and it was difficult to keep them upright. There was not a great deal of revenue along the road where the company proposed to run its mains, and overhead wires and wooden poles would enable it to serve those areas and the poorer areas in Truro with electricity, otherwise a supply would be impossible. The cost of steel poles would be £1,500, as compared with £1,000 for wooden poles. Mr. W. A. Phillips, for the Corporation, pressed for steel poles to be used everywhere. The inspector said it was a matter in which the Ministry would prefer agreement to be reached between the parties, and suggested that better terms might be obtained by that means than by leaving it to the Ministry. The Mayor said the Council had decided that under no consideration would it agree to wooden poles, and no compromise could be arrived at without a further meeting of the Council.

**Tynemouth.**—Loan Sanctioned.—The Corporation Electricity Committee has received sanction to a loan of £11,000 for mains, services, transformers and switchgear.

**Ulverston.**—Electricity Supply Progress.—It was recently reported by the Electricity Committee to the Urban District Council that during the past year the increase in electricity sold represented 34.3 per cent.

Loan.—Application is to be made for sanction to the borrowing of £3,000 for mains and services.

**United States.**—Electrical Development.—According to *Power*, plans are being made by the Georgia Power Company for the construction of a 100,000-h.p. steam power plant on the Chattahoochee River, near Atlanta, which will be the largest of its kind in Georgia and among the largest in the country. It will be the largest single development undertaken by the company since the completion of the Tallulah Falls

unit in 1913, and will serve as an auxiliary plant capable of bearing the entire load of the Atlanta metropolitan district. The plant will be linked with the general hydro-electric system of the company in north and central Georgia, and with large power projects in Alabama and other south-eastern States. The plant will consist of four units, with a capacity of 76,400 kW each, and construction is expected to begin as soon as materials and machinery can be assembled. The new plant will be equipped with a single steam turbo-generator, and will have two large boilers to deliver steam at a pressure of 450 lb. per sq. in. The boilers will be capable of delivering steam at this pressure and at a temperature of 725 deg. at a rate of 450,000 lb. per hour.

**Walsall.**—MAINS EXTENSIONS.—The Corporation Electricity Committee proposes, subject to a Government grant being made toward the cost, to carry out an unemployment relief scheme of mains extensions at an estimated cost of £7,000.

**Watford.**—ELECTRICAL DEVELOPMENT.—At a recent meeting of the Corporation Electricity Committee, the borough electrical engineer reported that during February 75 new consumers were connected to the system, 31 re-connected, and 25 disconnected, making a net total of 10,547 consumers, representing a connected load of 28,540 kW, and that during the month under review 2,559,694 kWh was distributed, as compared with 1,510,859 kWh during the corresponding period last year. This large increase was due to the exceptionally cold spell in the week ended February 17th. This increase, representing some three to four years' normal growth as compared with last year, was unforeseen, and certain districts, which, in the normal way would have been considered in the routine programme for alterations or extensions either next year or the year after, would have to be dealt with this summer. Preliminary estimates of the cost of laying additional mains and providing further sub-stations with increased transformer capacity, were now in hand, which showed that some £15,000 would be required for this purpose. He hoped to submit complete and detailed estimates at the next meeting.

# Tramway and Railway Notes.

**Continental.**—SPAIN.—A new section, about 1¼ miles in length, of the underground electric railway in Madrid was recently completed and opened for traffic.

GERMANY.—The electrification of the Berlin city railway has now been completed, and electric trains have commenced running over the entire length.

ITALY.—The work of electrifying the railway between Bolzano and Le Brennero has recently been completed, and experimental trains are now in operation on the section. At first the power will be supplied from the Prati power station of the Società Elettrica Tridentina, but later part will be furnished from the power station at Carrano of the Società Idroelettrica dell' Isarco. The power is received at 60,000 V and stepped down to 4,200 V in seven sub-stations along the line, five of them having a capacity of 6,000 kVA, the remaining two being of 9,000 kVA. It is hoped to inaugurate a regular service of electric trains on the section during May.

**London.**—NEW TRAMCARS.—The L.C.C. has put into service two new hill-climbing bogie-cars, the first of their kind. They will be on services 56-84, Victoria Embankment and Peckham Rye, and 58, Victoria and Catford—routes that include Dog Kennel Hill, East Dulwich, one of London's steepest inclines. The cars are of Pullman type, with extra seating comfort and ventilation and other improvements. On steep routes they will provide smoothness, speed, and accommodation equal to the best of the L.C.C.'s growing fleet of Pullman cars.

**Salford.**—TRANSPORT SCHEME.—The *Financial Times* reports that the Parliamentary Agents to the Corporation have presented petitions to both Houses of Parliament for leave to introduce a Bill this session to provide for the constitution of a Joint Board for operating the tramway and omnibus undertakings owned by themselves and "any other local authority or authorities as may be parties to the scheme." As the time for depositing Bills for this session has long since expired, the petitions will be referred to the Standing Orders Committees for them to decide whether the Standing Orders not complied with in respect of time should be dispensed with and permission given to introduce the Bill.

**South Africa.**—ABANDONMENT OF ROUTE.—According to the *South African Engineer*, the Minister of Railways has applied for the authority of Parliament to abandon the Monument-Sea Point railway and remove the rails and overhead equipment. Dr. van der Byl urged that the route should be converted into a motor road. The line was losing heavily under steam operation even before road competition had developed strongly, and the results under electrical operation show that the loss has increased even beyond the extra charges incurred through electrification. It is estimated that by the time the line is scrapped, it will have cost the Administration £300,000, made up of purchase from the Metropolitan and Suburban Railway Company, reconstruction, electrification and accumulated losses. The losses since 1915 are approximately £150,000.

# Telegraph and Telephone Notes.

**Abyssinia.**—WIRELESS COMMUNICATION.—The need for better communication has constantly been urged on the Abyssinian Government, and it has recently advertised for tenders for the supply and erection of a central wireless transmitting station of 20 to 25 kW for waves of 10 to 50 metres, capable of maintaining permanent communication with Europe, and of a receiving station capable of receiving from Europe and America. In addition, says *The Times*, tenders are called for for the supply and erection of five stations for use in the interior, capable of transmitting and receiving up to a distance of about 500 miles. The tenders are now closed, but the adjudication has not as yet been made known.

**Austria.**—TELEPHONE SERVICE.—The telephone cable system in Austria, which at present extends to a length of about 690 miles, is to be increased by 500 miles during the financial year 1929-30. The work includes a cable between Vienna and Gratz, with an extension to Wildon and Marburg. A second cable is also to be laid between Vienna and Linz.

**Germany.**—SIAM TELEPHONE SERVICE.—A radio-telephone service between Germany and Siam was inaugurated on April 26th. The service is conducted from the Nauen wireless station on a wavelength of 16.9 metres, the distance being some 5,300 miles.

**Iceland.**—TELEGRAPH SERVICE.—A recently-issued report shows that at the end of 1927 there were 1,892 miles of overhead and 80 miles of underground and submarine telegraph and telephone cables in operation in Iceland, an increase of about 150 miles during twelve months.

**The Telegraph Service.**—TARIFF REDUCTION.—Reduced rates for telegrams to the Far East became effective on May 1st on the systems of the Eastern Telegraph Co. and the Great Northern Telegraph Co.

HEBRIDES.—The Government cable-repairing ship has been successful in raising the broken cable in the Hebrides, providing telegraph facilities between Coll and Tiree. It has been repaired, and the wireless service to Portpatrick has consequently closed down.

**The Telephone Service.**—LONDON TOLL AREA EXTENDED.—With a view to improving the telephone service between London and the Home Counties, the lines serving 26 districts will in future be worked from the London toll exchange instead of from the trunk exchange, as at present.

AUTOMATIC EXCHANGES.—The services in the Colchester and Southend districts were recently converted to the automatic switching system.

**United States.**—FORD WIRELESS COMPANY.—The Ford Motor Company is organising a wireless communication company, the chief purpose of which is to link together the various Ford interests at home and abroad.—*Reuter's* (Detroit).

# Radio Notes.

**Australia.**—STATE OPERATION.—The Post Office authorities are calling for tenders for the supply of broadcasting programmes throughout Australia. The Post Office will operate the stations and be responsible for all technical details.—*Reuters* (Canberra).

**Belgium.**—STATE MONOPOLY.—The Chamber passed on April 26th a Government Bill creating a State monopoly of broadcasting. The law authorises the collection of a fee of 60 fr. (7s.) for every receiving apparatus, and the establishment of a National Broadcasting Institute. According to *The Times*, the Minister of Posts and Telegraphs states that the new organisation will be a public educational body which will respect liberty of thought and opinion.

It is estimated that there are at present 200,000 receiving sets in use in Belgium, and licence fees have been paid on less than one-tenth of their number. Cases of fraud will be severely punished.

**France.**—STATE CONTROL.—Although the text of the Wireless Broadcasting Bill, which was approved by the Cabinet on April 25th, will not be published until it is distributed in the Chamber, the main lines of the measure are now available, says *The Times*. A special Government office with its own budget will be constituted to control all broadcasting in France. Expenses will be met by the levy of a tax on all

receiving sets, varying from 20 fr. to 60 fr. (roughly, 3s. 4d. to 10s.), according to their strength. Licences to broadcast will be granted to private companies after the technical dispositions of their stations and the utility of their programmes have been approved by the central office. The Bill also provides for the protection of literary, artistic, and scientific rights, and establishes that no intellectual work shall be broadcast unless agreement has previously been reached between the responsible company and the author.

**Poland.**—Short-Wave Transmitter.—"Radio Poznanskie" is now engaged in erecting a short-wave transmitter, which, it is understood by *World-Radio*, will have 0.75 kW output power, and will be used both for broadcasting and telegraphy. The first experimental transmission will be carried out on a wavelength of 30.5 or 38.5 m., or, possibly below 20 m. The new station in Posen is to be used for publicity purposes in connection with the exhibition this month.

**Germany.**—Licences.—The number of broadcasting subscribers in Germany increased during the first quarter of 1929 by 202,327, the total on April 1st being 2,837,894. The increase since April 1st, 1928, says *World Radio*, is 603,162.

**Sweden.**—Receiving Licences.—The number of wireless receiving licences in Sweden (price Kr.10 a year) at the end of March, 1929, was over 400,000, an increase of 19,800 since the end of 1928, when the number was 380,860. There are now 65.8 licences for every thousand inhabitants, compared with 62.6 at the end of 1928.—*Reuter's Trade Service* (Stockholm).

# Contract Information.

**When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.**

## Contracts Open.

**Australia.**—Melbourne.—June 4th. State Electricity Commission of Victoria. 22,000-V transformers and spares. (B.X. 5216.)*

June 26th (extended from May 15th). Victorian Railways. One geared three-phase electric winding engine. (A.7650 and A.7853.)*

June 18th. Posts and Telegraphs Department. Switchboard cable. (B.X. 5228.)*

June 25th. Telephone cable terminal boxes of the protected type. (B.X. 5231.)*

Sydney.—June 22nd. Public Works Department. Transformers and spares for Burrinjuck hydro-electric development sub-stations. (B.X. 5230.)*

June 4th. 18 electrically-operated water level indicators. (B.X. 5233.)*

July 10th. New South Wales Government Railways. One 750-kW turbo-alternator for Ultimo Power Station. (Specification No. 847, 5s.) 2,200-V ironclad switchgear for Argyle sub-station. (Specification No. 852, 2s. 6d.) Two switch operating batteries. (Specification No. 850, 2s. 6d.) Two motor-generator sets. (Specification No. 851, 2s. 6d.) Specifications from the Chief Electrical Engineer, 61, Hunter Street, Sydney.

**Belfast.**—May 21st. Electricity Department. Supply delivery and erection of h.p. armour-clad switchgear, air preheaters, 22,000 V 3-phase transformers, and cable drum trailer and tractor. (See this issue.)

**Bulgaria.**—May 20th. Syndicat Hydraulique de la Centrale Vatcha-Kritechim Plovdiff. Supply and installation of two Francis-type turbines to utilise 5 cu. metres of water per second under a head of about 295 ft., two 5,000-kVA generators; two 6,000-66,000-V, 5,000-kVA transformers, two 6,000-66,000-V, 1,000-kVA transformers and two 6,000-380-220-V, 150-kVA transformers.

**Chertsey.**—May 18th. Board of Guardians. Installation of electric lighting at the Institution at Ottershaw. (April 19th.)

**Dundee.**—May 6th. Education Authority. Electric lighting installation for the new school at Dudhope Terrace. Specifications, &c., from Master of Works.

**Edinburgh.**—May 6th. Education Authority. Installation of electric lighting at the Gorgie new special school and annexe to Trinity Academy. Schedules from the Education Offices.

May 21st. District Board of Control. Electrical work for the two higher grade blocks and mortuary at Gogarburn. Schedules from S. Kaye, architect, 14, Hill Street, Edinburgh.

**Egypt.**—Cairo.—May 15th. Ministry of Public Works. 120-kW d.c. Diesel-engine generating set and a small electrically-driven cooling water pump. Forms of tender from the Chief Inspecting Engineer, 41, Tothil Street, S.W.

May 15th. Diesel engine-driven electric generating set with accessories, for the Government Press Power Station at Bulaq. (B.X. 5246.)*

May 25th. Prison Administration. Stores (including lamps and electrical articles). (C. 3022.)*

**Glasgow.**—May 16th. Electricity Department. Supply of cables, cookers, meters, arc lamp carbons, and kettles for 12 months. (See this issue.)

**Grimsby.**—May 8th. Electricity Department. Supply of 8,000 yd. each of paper-insulated lead-covered, 6,600-V, and l.p. cable. (April 26th.)

**Hull.**—May 16th. Electricity Department. Supply and laying of underground cables. (April 26th.)

**India.**—May 8th. Assam-Bengal Railway Co., Ltd. Turbo-generator set for Pahartali. (April 19th.)

May 21st. India Stores Department. One 400-kW, 6-phase rotary convertor set and accessories for H.M. Mint, Calcutta. (B.X. 5255.)*

May 10th. South Indian Railway Co., Ltd. Spare parts for train lighting cells (wood sheet separators). (See this issue.)

**Lithuania.**—Kovno.—Replacement of the existing horse tramway service by an electric tramway system. (A.X. 7863.)*

**London.**—Bethnal Green.—May 22nd. Borough Council. Electric lighting installation at two blocks of tenement dwellings. (See this issue.)

St. Marylebone.—May 6th. Electricity Department. L.p. and e.h.p. underground cables for 12 months. (April 26th.)

Central Electricity Board. May 25th. Supply, delivery and erection of 33,000-V metal-clad switchgear for South-East England Electricity Scheme, 1927. (See this issue.)

Woolwich.—May 15th. Union Guardians. Supply of electrical refrigerator. (See this issue.)

**Manchester.**—May 6th. Electricity Department. Supply, delivery, and erection of three 1,000-kVA static transformers. (April 26th.)

**Morocco.**—Rabat. June 6th. Morocco Post and Telegraph authorities. Five tons of annealed copper wire, 1. mm. dia. 10 tons of bronze wire, 15/10 mm. dia. Five tons of bronze wire, 2 mm. dia. 55 tons of high-conductivity copper wire, 2 mm. dia., and 165 tons of high-conductivity wire, 3 mm. dia.

**New Zealand.**—Auckland.—June 3rd. Auckland Electric Power Board. Pilot cable and accessories. (B.X. 5244.)*

Wellington.—June 18th. Posts and Telegraph Department. Telephone cords. (B.X. 5251.)*

August 6th. Public Works Department. One 120-ton four-motor overhead travelling crane and runway. (A.X. 7810.)*

**Rumania.**—May 30th. Municipality of Cluj. Compressor for cooling plant with motor and condenser. (A.X. 7838.)*

**South Africa.**—Johannesburg.—May 16th. South African Railways and Harbours. Electric signalling apparatus. (B.X. 5165.)*

June 20th. One 10-ton and three 4-ton electric level luffing cranes. (A.X. 7828.)*

Bloemfontein.—May 18th. Electric Supply Department. Turbine and generator, condensing plant and auxiliaries; switchgear and cables; cooling spray pond equipment, or alternatively cooling tower complete. (B.X. 5192.)*

Pretoria.—May 23rd. Posts and Telegraph Department. Rubber-covered wire and telephone cables. (B.X. 5229.)*

May 30th. Telegraph materials, &c. (A.X. 7767.)

May 20th. Town Council. Cables, switchgear, and transformers. (B.X. 5245.)*

May 27th. Transformers. (B.X. 5258.)*

**Stockport.**—Electricity Department. Supply of electric lamps for 12 months. (April 26th.)

**Uruguay.**—Montevideo.—May 22nd. National Administration of the Ports. Four electric cranes (to lift 3 metric tons) mounted on trucks. (A.X. 7814.)*

**Walthamstow.**—May 8th. Electricity Department. L.p. distributor and service cables; e.h.p. and l.p. feeder cables. (April 19th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

# Contracts Closed.

**Australia.**—BRISBANE.—City Council.
Seven traction motors for new tramcars (£1,487).—British General Electric Co., Ltd.
Thirty-five do., with roller bearings (£8,636).—Metropolitan-Vickers Electrical Co., Ltd.
Thirteen do. (£3,406).—Australian General Electric Co., Ltd.
Control equipment, 3 sets (£546).—British General Electric Co., Ltd.
25 sets ditto (£5,725).—Australian General Electric Co., Ltd.
SYDNEY.—New South Wales Government Railways.
Two 750-kVA transformers (£1,135).—Australian General Electric Co., Ltd.
Two electric goods elevators (£3,534).—Major, Stevens and Coates, Ltd.
Public Works Department.
Three 600-kVA transformers for Port Kembla sub-stations (£1,905).—Standard Waygood, Ltd.
Three 60 kVA induction regulators for Barren Jack (£1,599).—Australian Westinghouse, Ltd.
Four 600-kVA transformers and spare bushings (£3,338).—Australian General Electric Co., Ltd.
Eight do. and spare bushings (£1,944).—British Electric Transformer Co., Ltd.
Switchgear for State transmission lines (£1,182).—Ferguson, Pailin, Ltd.
—*Tenders.*

**Birkenhead.**—Electricity Committee. Accepted :—
260 yd. 11,000-V cable (£165).—W. T. Glover & Co., Ltd.
Two miles l.p. single-core v.i.r. cable (£305).—Liverpool Electric Cable Co., Ltd.

**Bridport.**—Electricity Undertaking.
H.p. and l.p. cable, sub-stations, trenching and temporary reinstatement (£8,060).—Stanley Cooper & Co., Ltd.

**Brighton.**—Lighting Committee. Accepted :—
Duplicate telpher unit and runway at Southwick power station (£5,500).—Strachan & Henshaw, Ltd.
Ash disposal plant at Southwick (£5,360).—Ash Co. (London), Ltd.
Work in connection with extensions to circulating water system at Southwick (£1,038).—Brackett & Co., Ltd. (in lieu of previous quotation).

**Ilford.**—Electricity Committee. Recommended :—
500-kW transformer (£243).—Crompton Parkinson, Ltd.
Three-panel switchboard (£171).—Long & Crawford, Ltd.
Transformer for supply to Claybury Asylum (£104).—Foster Engineering Co., Ltd.

**London.** — POPLAR. — Electricity Committee. Recommended :—
Pipework (£106).—Millwall Engineering Co.
Valves.—Shaw, Son & Greenhalgh.
Pipework on evaporating system (£164), and auxiliary plant (£113).—Vickers, Ltd.
Soot blowers (£200); spray chamber (£506).—International Combustion, Ltd.
WAR OFFICE.
Zinc plates.—Edison Swan Electric Co., Ltd.
LONDON & NORTH-EASTERN RAILWAY.
Electric lamps.—Edison Swan Electric Co., Ltd.
BATTERSEA.—Electricity Committee. Recommended :—
Installation of duplicate 1,000,000 gal. per hour condensing water pump (£1,615).—Foundation Co., Ltd.
ST. MARYLEBONE.—Electric Supply Committee. Recommended :—
Two rectifier sets for Blandford Street sub-station (£17,412). British Brown-Boveri, Ltd.
One 2-bearing motor convertor (£9,430).—British Thomson-Houston Co., Ltd.
Switchgear (£4,110).—A. Reyrolle & Co., Ltd. (£1,996).—Ferguson, Pailin, Ltd.
METROPOLITAN ASYLUMS BOARD.—Works Committee. Electric lighting installation, The Hostel :—

| | |
|---|---|
| J. HOLBROOK & TATTERSALL, LTD. (Recommended.) ... ... ... ... ... ... ... | £243 |
| Carr Bros. ... ... ... ... ... ... ... ... | 244 |
| Telephone & Electrical Maintenance Co. ... ... | 305 |
| A. Hawkins & Sons ... ... ... ... ... ... | 329 |
| Alpha Manufacturing & Electrical Co., Ltd. ... | 342 |
| G. J. Alder, Thornton & Co., Ltd. ... ... ... | 370 |
| Read & Partners, Ltd. ... ... ... ... ... | 388 |
| W. J. Furse & Co. (London), Ltd. ... ... ... | 395 |
| T. Clarke & Co., Ltd. ... ... ... ... ... ... | 400 |
| M. J. T. Thomas & Co. ... ... ... ... ... | 590 |
| Aldwych Electrical, Ltd. ... ... ... ... ... | 657 |

HACKNEY.—Electricity Committee. Recommended :—
Revised estimates for the 30,000-kW turbo alternator set, &c.—
Turbo-alternator and condensing plant (£104,052).—C. A. Parsons & Co., Ltd.
E.h.p. switchgear (£62,200).—A. Reyrolle & Co., Ltd.
Repairs to battery at Millfields Road (£990).—Tudor Accumulator Co., Ltd.
Alterations and improvements to boiler-house plant (£2,200).—Babcock & Wilcox, Ltd.

**Sheffield.**—Water Committee. Accepted :—
Electric motors and pumps for Rivelin pumping station (£1,055).—Rees Roturbo Manufacturing Co., Ltd.

**Stirling.**—Town Council. Accepted :—
Electrical work at houses in Drip Road.—A. Brewster.
At houses in Burnside Street.—Graham & Morton, Ltd.

**Stoke-on-Trent.**—Electricity Committee. Accepted :—
E.h.p. and l.p. overhead transmission lines for 12 months.—Overhead, Ltd.
Mental Deficiency Committee. Accepted :—
Heavy oil engine electric plant for Stallington Hall (£898).—National Gas Engine Co., Ltd.
Housing Committee. Accepted :—
Wiring 16 houses at Eaton Street, Hanley, for electricity.—E. Holloway.
Health Committee. Accepted :—
Erection of overhead electricity cable to laundry at Stanfield Sanatorium (£105).—A. Bew.

# Forthcoming Events.

**Institution of the Rubber Industry.**—Monday, May 6th. Blackfriars Theatre, William Street, New Bridge Street, E.C. 7.30 p.m. "Cements and Adhesives," Mr. S. D. Sutton; and "Heats of Combustion of Rubber, Gutta-Percha and Balata," Mr. T. H. Messenger.

**Television Society.**—Tuesday, May 7th. Engineers' Club, W. 7 p.m. "Some Practical Considerations in the Building of Television Apparatus." Capt. R. Wilson and Mr. A. A. Waters.

**Electroplaters' and Depositors' Technical Society.**—Wednesday, May 8th. Northampton Polytechnic Institute, E.C. 8.15 p.m. "Some Possible Uses of Alternating Currents in Electro-deposition." Mr. H. C. Cocks.

**Institute of Fuel.**—Wednesday, May 8th. Burlington House, W. 6 p.m. "The Scope of the Chemical Engineer, with Special Reference to the Boiler-house and the Fuel Industries." Dr. S. Wolf.

**Institution of Electrical Engineers.**—Thursday, May 9th. Institution, London, W.C. 6 p.m. Annual general meeting.
**(London Students' Section).**—Saturday, May 4th. Visit to an all-electric farm, East Grinstead.

**Physical Society.**—Friday, May 10th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

**Junior Institution of Engineers.**—Friday, May 10th. Monico Restaurant. 6.30 for 7 p.m. Annual dinner.

**Institution of Mechanical Engineers.**—Friday, May 10th. Great George Street, S.W. 6 p.m. Special general meeting. To consider and, if thought fit, pass resolutions as to a petition for a Royal Charter.

# Notes.

### The Battersea Power Station.

At a meeting of Westminster City Council, on April 25th, the proposed power station at Battersea was discussed, and the following resolution was adopted: That this Council views with considerable alarm the possibility of serious injury to health and property which may be caused by the emission of sulphur fumes from the proposed electricity power station at Battersea, and that the Electricity Commissioners be asked to reopen the whole question of the erection of the proposed power station at Battersea with a view to consideration being given to the selection of a site for the station outside the metropolis, where the emission of fumes, smoke, soot, and dust cannot prove to be injurious to health and property.

### Wireless Pictures from Australia.

When the ss. *Orvieto* sailed recently for Australia she included amongst her passengers Mr. J. A. Breen, an engineer on the staff of Wireless Pictures, Ltd., who is conveying the first wireless picture transmitting and receiving apparatus to Australia. On his way he will stay for a week at Colombo, where the apparatus will be demonstrated to the Ceylon Government. At Sydney he will meet the Australian agent of the company, Mr. W. Blogg, who is well known in this country as the late managing director of Amplion (Australasia), Ltd. Possibly it will not be long before short-wave enthusiasts are able to receive pictures from the stations at Sydney (2FC) and Melbourne (3LO).

It is not perhaps generally known that in addition to the British stations (2LO and 5XX) the Vienna transmissions of still pictures by the Fultograph method on 520 metres are often relayed by Linz on 350 metres; when Vienna is jammed this station is frequently picked up quite well. In addition to the Koenigswusterhausen transmissions of still pictures, Berlin (Witzleben) has lately been conducting transmission at 8 o'clock on several evenings during the week, and sometimes this is relayed by other German stations.

### Diesel-Electric Ferry Boat.

About October last we published some particulars of a Diesel-electric ferry boat, built for the Argentine by Messrs. Yarrow and Co., the electrical equipment being furnished by the Metropolitan-Vickers Electrical Co., Ltd. This little craft, whose dimensions are length 145 ft., breadth 39 ft. 6 in., draught (loaded) 4 ft. 5 in., and displacement 340 tons, which is designed for service on the River Parana, successfully crossed the Atlantic with only one stop at St. Vincent. The propelling machinery, designed, of course, for the intermittent service of a ferry boat, was in continuous operation for periods of eleven to seventeen days in the Atlantic, which fact is perhaps as good a proof of the reliability of the electric drive for ships as could be had. The electricity generating plant consists of two non-reversible four-stroke-cycle, single-acting, trunk-piston heavy-oil engines of the M.A.N. airless injection type developing 300 b.h.p. at 350 r.p.m. Each engine is coupled to a 170-kW direct-current propulsion generator and also a 35-kW auxiliary generator for supplying current for auxiliary purposes and for exciting the main generators and motors. The propulsion is by twin screws at each end of the vessel, each of the four propellers being driven by a 200-h.p., 250-volt, 350-r.p.m. motor. A feature of special interest is the control scheme, which provides for manœuvring control from each of the two pilot houses situated at opposite ends of the bridge deck, and from the engine room.

### Water Power in France.

The development of French water-power resources is largely bound up with the financial state of the country. Hydro-electric plant requires large capital outlay and therefore easy money is a necessary condition for enterprise of this description. For some time past there has been in evidence a decided slowing down of water-power development in many parts of Europe, owing to the tightness of the money market and the high rates of borrowing, but just recently the financial position has improved, and it is now to be hoped that the prospects in the field of hydro-electric enterprise have become considerably brighter. The publication of the French Water-Power Year Book (Annuaire de la Houille Blanche Française) for 1928-9, which has just been issued by the *Revue Générale de l'electricité*, seems to justify a certain amount of optimism for the immediate future, though the tone of many of the articles in this publication is still cautious and reserved. Among several projects which have been started, or recommenced after temporary cessation, may be mentioned the Eygun-Lescun plant on the Gare d'Aspe in the Basses Pyrénées, of 14,400-kW capacity; the Pizançon plant of 19,000 kW; and the Kembs plant on the Rhine, 60,000 kW, to be subsequently enlarged. Of those which have been recommenced, mention should be made of the Brommat plant on the River Truyère in the Department of Aveyron, of 56,000-kW capacity.

Railway electrification will be continued on a fairly large scale. The line from Culoz to Modane on the Paris-Lyon-Méditerranée system, is now to be completely electrified, after hanging fire for some months, and it is hoped to complete the work next year. The power required will be derived from several sets of hydro-electric plant in the Sarvie district on the rivers Arly and Bonnant. Many of them are owned by the Soc. d'Electro-Chimie, d'Electro-Metallurgie and des Aciéries Electriques d'Ugine. Much of the work for the traction sub-stations has been entrusted to the Comp. Fran. Thomson-Houston. The third-rail system has been definitely adopted. Last year the Midi railway possessed 480 miles of electrified lines, but now the total is 546, the additional 66 miles being accounted for by the conversion of the line from Pau to Laruns, Buzy to Bedous, and then across the Pyrenees to Forges d'Abel. The complete electrification programme of the company contemplates further great extensions, namely, the conversion of 1,140 miles of existing track, and the construction of 358 miles of new line, the necessary current being derived from six hydro-electric plants already erected in the Pyrenees district. A seventh plant of 11,000 kW will be constructed at Artouste in the Vallée d'Ossau.

On the general subject of electrical power throughout France it is interesting to note from the statistics issued by the Ministry of Public Works that upwards of 11,000 million kWh of electricity was produced in 1926, compared with 7,480 million kWh in 1923. Working at 70 per cent. of full capacity, the hydro-electric plants produced 4,780 million kWh during 1926. Considerable economies in running cost have been effected by linking up hydro-electric and thermal power stations and adjacent electricity supply undertakings. One of the leading French railway companies will, it is said, obtain electricity for fraction purposes from plant owned by an electro-metallurgical company; and in other ways the obviously sound policy of utilising plant to full capacity by judicious co-operation is being steadily pursued.

### Appointments Vacant.

Electro-technical assistant for Manchester Corporation. Working engineer for Royal School for Deaf and Dumb Children, Margate. Meter tester (£200) for Hull Corporation. (See our advertisement pages to-day.)

### Educational.

The governing body of Manchester Municipal College of Technology offers a scholarship of £50 per annum for three years. (See our advertisement pages to-day.)

### A Large Electric Furnace.

A 30-ton electric steel-making furnace, the largest of its type built in England, is reported to have been completed by Messrs. Davy Bros., Ltd., of Sheffield. It will be shipped to Reinosa, Northern Spain, for installation there as additional plant for the production of high-class steel.

### T.C.C. Condensers.

In the reference on p. 633 of our April 5th issue to the electrolytic condensers marketed by the Telegraph Condenser Co., Ltd., it was stated in error that the minimum working peak pressure was 12 V d.c., whereas, of course, the correct word should have been "maximum."

### Electrolysis of Water.

Some particulars of experiments made with the electrolysis of water, given in *La Nature*, show that the energy necessary for electrolysis diminishes with an increase of pressure created by the gases produced. Left to themselves, the oxygen and hydrogen given off occupy a space 1,865 times greater than the amount of water treated; enclosed in a non-expansible cylinder, the gases will exert a pressure equal to 1,865 atmospheres. Thus with the expenditure of a very small amount of electricity the gases may be obtained under enormous pressures, which may be utilised for all kinds of industrial purposes, it is declared, while if allowed to generate free from pressure the gases, either separate or mixed, may be employed as an auxiliary for fuel already undergoing combustion. Mr. Hausmeister, who has been carrying out the experiments, has constructed, in conjunction with German railways, several installations which are claimed to work at high pressure for industrial purposes, and are said to be giving excellent results.

### B.S.S. for Insulating Boards and Tubes, and Flame-proof Enclosures.

The British Engineering Standards Association has just issued B.S.S. No. 316-1929, for synthetic-resin varnish-paper boards and tubes for general electrical purposes, and B.S.S. No. 229-1929, for flame-proof enclosures for electrical apparatus. The provisions of the former specification are confined to what is termed Grade II material, *i.e.*, synthetic-resin varnish-paper boards and tubes, the principal characteristic of which is high electric strength at high temperature. This grade of material is suitable for use on high-voltage oil-immersed plant, and on low-voltage apparatus in air. The specification does not at present apply to Grade I material, which is defined as including boards and tubes, the principal characteristics of which are relatively low water-absorption, high resistivity, low dielectric losses at radio frequencies, and good machining properties. This material is such as is required for use on apparatus where it is important that high insulation resistance shall be maintained under all conditions of humidity. The specification lays down suitable working limits for the materials to which it applies. A series of appendices supplies detailed instruction for the carrying out of the necessary tests, and two of them give abridged schedules of tests recommended for application to boards and tubes intended for certain specific uses.

B.S.S. No. 229 defines the performance required for a flame-proof enclosure, and the tests to be carried out to verify such performance. The special features of design and construction of apparatus are specified in the several British Standard Specifications dealing with particular flame-proof apparatus. This specification, which is a revision of the 1926 edition, embodies the results of experience in testing which has been gained since the issue of the original specification. Provision is now made for preliminary observation tests, and the number of tests to be performed has been indicated.

Both the above specifications and the methods of test given therein have been based on information supplied by the British Electrical and Allied Industries Research Association, and represent the results of a considerable amount of research work carried out by the Association.

Copies of the publications may be obtained on application to the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

### Training School for "Underground" Employés.

Work is being commenced on a new training school at Lambeth North station for the drivers, guards, signalmen and other grades concerned in the operation of the Underground Railways. The school will contain the latest forms of electrical and mechanical equipment, together with models of signals and lifts, and diagrams. The work will be completed in about two months.

### Lifts for Salmon.

The effects of river dam construction on Scottish salmon fishing were discussed on April 25th, when a Select Committee of the House of Lords resumed consideration of the Grampian Electricity Company's Bill, which seeks power to form reservoirs and erect dams for the supply of electricity to the Highlands.

Mr. Wilson Armstead, a fishery expert, showed with the aid of a model how salmon were to be helped over the lower and mid-Farrar falls by electric lifts. The salmon, he said, entered a pool 16 ft. by 8 ft. by 2 ft. deep. This pool rose to the top of the dam, where the fish emerged into the lock. It would be like swimming through a series of pools, except that one of the pools was a lift.

### Aluminium Data.

We have received from the British Aluminium Co., Ltd., further data sheets for inclusion in the company's publication, the "Aluminium Handbook." Sheets C.2 and C.3 give revised information regarding span constants and constructions for steel-cored aluminium overhead lines; sheets A.73 and A.74 contain enlarged tables of the properties of stranded aluminium and steel-cored aluminium conductors, revised in conjunction with the British Engineering Standards Association (these sheets, together with C.2 and C.3, are intended to replace existing sheets in the handbook); C.16 is a new data sheet giving authentic information regarding the latest developments in aluminium-copper tappings; and A.166 is a new data sheet on expanded aluminium sheets.

### New Radium Clinic.

A hospital exclusively for women, run entirely by women, and named after a woman, is shortly to be opened in Fitzjohn's Avenue, Hampstead, N.W. It will be the Marie Curie Cancer Hospital for Women, which, it is hoped, will be officially opened, says the *Daily Mail*, in the autumn by Mme. Curie, the discoverer—with her husband—of radium. It will be the first large radium clinic to be organised in this country by medical women. The plans for the alteration of the house have been drawn up by Miss Elizabeth Scott, the architect, and among the women who will help to run the hospital are three from the Cancer Research Board and the senior surgeons, respectively, of the South London Hospital for Women, the Elizabeth Garrett Anderson Hospital, and the New Sussex Hospital.

### Local Society.

At the annual general meeting of the Paisley Association of Electrical Engineers on April 9th, the following officers were elected:—President, Mr. J. Orr; vice-president, Mr. J. E. Adam; hon. secretary, Mr. J. M. Barbour; hon. treasurer, Mr. George H. Fisher; committee: Messrs. H. Aberdein, G. U. Campbell, J. Durrell, J. S. Kilpatrick, F. E. Moss and Alex. Todd. Auditors, Mr. J. Rothera and Mr. J. Cunningham.

### Municipal Tramways Association.

The Mayor of Blackpool invited the Municipal Tramways and Transport Association to hold its conference in Blackpool in September next. The Association replied to the Tramway and Electricity Committee stating that in due course Mr. Charles Furness, borough electrical engineer, Blackpool, would be elected president of the Association, and that in the opinion of the Council of the Association the conference ought to meet in Blackpool during the year of Mr. Furness's presidency. The next conference will be held at Yarmouth.

### German High-voltage Installations.

The Society for the Study of High-voltage Installations, of Berlin, recently held a conference at Cologne which was very largely attended. The Society occupies itself with the treatment of problems which are connected with the promotion of the transmission of power at high voltage, and its members consist of almost all the important German electricity works and constructional firms in the different branches, as well as of a number of high-school professors. Among the subjects discussed at the Conference was that of high-pressure cables. In this respect very difficult problems have to be solved before there can be any question of substituting to a larger extent the present overhead lines by underground cables. Another subject was insulating oil, it being considered to be of great importance to render again serviceable transformer oil which has become unserviceable. A further part of the discussion referred to the scientific explanation of the phenomena which are connected with the electrical break down of the oil.

### A Three-Factor Two-Part Tariff.

In commenting upon the appointment by the Electricity Commissioners of a Committee to study methods of charging for electricity (ELECTRICAL REVIEW, March 29th, p. 553), we referred to the existing multiplicity of systems, and quoted an example of a two-part tariff which we thought was unnecessarily complicated. We had in our mind the possible trouble occasioned to the consumer, but we are interested to learn that in operating this tariff the details are not published in the schedule of charges. The consumer merely applies to the company for a statement of the annual fixed charge for his premises, and the company makes the necessary assessment and notifies him of the figure on an application form embodying the particulars.

The tariff is based on the principle that the primary or fixed charge should be as equitable as possible as between consumers, and is a combination of the three factors which can be used as a basis when assessing a fixed charge, namely, lighting connections, floor area, and ratable value. Any one of these, if used by itself with a fixed percentage or rate, is found to be inequitable, but by using the three in combination the anomalies of each are said to be smoothed out, giving a correspondingly fair result.

We are informed by the engineer of the company which adopted the scheme that statistics bring to light an interesting feature. It transpires that there is a very close approximation between a curve formed by the fixed charges calculated on the three-factor basis and a curve resulting from a sliding percentage of the ratable value, ranging from 18½ per cent. of the ratable value of houses of £15, down to 12½ per cent. for houses assessed at £75 and upwards per annum. He points out that anomalies inherent in a single-basis tariff still exist, but is hoping that under the 1925 Rating and Valuation Act a greater measure of uniformity will be attained in the reassessments, thus making a sliding percentage of ratable value a reasonably practicable basis for a two-part tariff which, in addition to being equitable and simple, would, by reason of its flexibility, be peculiarly adaptable to the differing conditions of various districts.

### Electric Lamp Invention.

The part played by Mr. St. George Lane Fox Pitt in the invention of the carbon incandescent electric lamp, and the modern method of electric lighting, is the subject of a communication from Mr. A. A. Campbell Swinton, F.R.S., in the current issue of the I.E.E. *Journal*. He states that neither in Mr. James Swinburne's address before the Institution on Sir Joseph Swan's electrical work, delivered in December last, nor in the "Personal Recollections" of Sir Ambrose Fleming published in the February *Journal*, is due justice done to the valuable and pioneer work that was carried out on this important subject by Mr. St. George Lane Fox Pitt. He it was who first protected on March 20th, 1879, and more specifically patented in 1880, the method of treating a lamp filament by raising it to an incandescent state by sending a current through it while immersed in hydrocarbon, a process which became known as "flashing." Sir Hiram Maxim came after Mr. Lane Fox Pitt. Mr. Campbell Swinton's contention is that, though Swan was prior to Edison in inventing the lamp, Lane Fox Pitt was prior to both in what was a much more fundamental idea, namely, that of distribution at constant potential, with lamps, dynamos, and batteries all connected in parallel. Carbon-filament lamps are now obsolete, but Lane Fox Pitt's scheme of parallel distribution still holds the field.

# Institution Notes.

### Institution of Electrical Engineers.

KELVIN LECTURE.—The twentieth Kelvin Lecture was delivered on April 25th by Dr. G. C. Simpson, F.R.S., who dealt with the subject of "Lightning" in a fascinating manner. His lantern slides and explanatory diagrams were very instructive, whilst his theory and many of his statements quite upset commonly-held ideas on the subject. Sir Oliver Lodge proposed, and Mr. W. B. Woodhouse seconded, a vote of thanks to the lecturer, and the meeting was followed by an informal Council dinner at the Hotel Cecil.

LONDON STUDENTS' SECTION.—The Committee's report for the 1928-29 session shows that the number of students in the Section is now 1,307, a decrease of 56 since last session. During the session ten meetings were held, the average attendance being 68.5, compared with an average of 76 during the 1927-28 session. A joint meeting was held with the Institutions of Civil and Mechanical Engineers. The Committee hopes to take steps next session to increase the attraction of the meetings. The number of visits during the session was 11, the average attendance being 15; it was necessary to cancel two visits on account of poor support. A dinner and a dance were held, and were extremely well attended. The summer meeting in 1928 consisted of a tour through Holland and West Germany, 32 students from London and the provinces taking part.

WIRELESS SECTION COMMITTEE.—The following gentlemen have been nominated by the Wireless Section Committee to serve on the Committee from October 1st, 1929:—*Chairman:* Capt. C. E. Kennedy-Purvis, R.N.; *new ordinary members:* Mr. R. H. Barfield, M.Sc., Mr. A. J. Gill, B.Sc., Prof. E. Mallett, D.Sc., Mr. L. C. Pocock, and Commander J. A. Slee, C.B.E., R.N.

METER AND INSTRUMENT SECTION.—The meeting arranged today, May 3rd, has been cancelled.

# Our Personal Column.

**Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.**

The many friends of Mr. A. Brammer, general secretary of the Association of Supervising Electrical Engineers, will be glad to learn that he is recuperating beside the sea after a serious illness from congestion of the lungs. He is much improved, and hopes to be back at his post next week.

Mr. J. W. Thomas, LL.B., B.Sc., A.M.I.E.E., who has held the position of assistant general secretary of the Electrical Power Engineers' Association for the past nine years, has now resigned his post in order to commence practice at the Bar. Mr. Thomas has joined the Northern Circuit, and his chambers are situate at 60, King Street, Manchester. We are sure that the large number of those who have had an opportunity of watching Mr. Thomas's progressive career will join with the Electrical Review in wishing him every success. Barristers with an inside knowledge of the electrical industry are all too few, and we can foresee Mr. Thomas's services being in considerable demand before very long.

The Sheffield Corporation Electricity Committee has expressed regret at the resignation of Mr. S. E. Fedden, general manager and engineer of the Electricity Supply Department, congratulating him on his appointment under the Central Electricity Board as district engineer for the Mid-East England Electricity Scheme, 1929, and expressing best wishes for his future success. The Committee advises that applications be invited for the vacant position at a commencing salary of £1,250 per annum.

Mr. C. F. Walkland, of the Sheffield Electric Supply Department, has been appointed chief clerk in connection with the new Mid-East England Electricity Scheme. He has been in the employ of the Sheffield Corporation for the last 16 years.

Mr. Kenneth Hunter, of Kyle, Palmer & Co., Ltd., writes from Kuala Lumpur, Federated Malay States, stating that as from April 15th he took over the duties of sales manager for the firm and started on a tour of Malaya from Singapore to Penang, and Southern Siam, as far as Victoria Point on the West Coast and Bangkok on the East Coast. He was to visit practically every tin and gold mine, large rubber estate, rice mill, Government department, consulting engineer, &c.

The staff of the Gravesend Electricity Works were entertained by the Corporation at dinner on April 20th to celebrate 25 years' working of the undertaking. The Mayor (Councillor R. McGregor), members of the Corporation and officials were present, and the toast "The Gravesend Electricity Undertaking" was proposed by Councillor J. W. Clunn, and replied to by the borough electrical engineer, Mr. C. F. McInnes, who presented cases of pipes to Mr. William Foad and Mr. George Gardner in recognition of over 25 years' valuable assistance to him. Later Mr. McInnes was presented by the staff with a case containing a pen and pencil as a token of esteem.

Subject to the approval of the Council, Mr. H. A. Blackburn, of Huddersfield, hase been appointed tramway manager at Keighley, at a salary of £500 per year. Mr. Blackburn was for four years rolling stock superintendent to the Plymouth Corporation Tramways Department, and was for two years commercial assistant with the Metropolitan-Vickers Electrical Co., at Trafford Park. At present he is technical assistant at Karrier Motors, Ltd., Huddersfield. He is the son of the Huddersfield tramway manager.

The marriage took place at Barnstaple, on April 20th, of Mr. Hadley Victor Billing, a member of the staff of the Westminster Electric Supply Corporation, and Miss G. I. Ham, of Newport, Barnstaple. From his colleagues the bridegroom received a canteen of cutlery and a silver and cut-glass bowl.

Mr. F. Favell, engineering assistant in the Stoke-on-Trent Electricity Department, has been appointed power house superintendent, in succession to Mr. G. A. Vowles, appointed engineering assistant at Hull.

Major T. H. Howard, who has been in charge of the Sheffield relay station of the B.B.C. for the past three years, has been appointed to the Manchester station.

Mr. Sven Velauder, formerly electrical engineer of the South Sweden Power Co., has been elected as hon. professor of the Electrical Plant Section of the Technical High School of Stockholm.

Mr. N. G. Barraclough has been appointed chief engineer to the Workington Iron and Steel Branch of the United Steel Companies, Ltd. Mr. Barraclough, who has been engaged as electrical engineer to the same company for about 20 years, was formerly in the engineering department of the National Boiler & General Insurance Co., Ltd., Manchester.

The staff and employés of the Dewsbury Electricity Department presented a mahogany clock to Mr. George Heaton on the occasion of his marriage.

According to the *Yorkshire Post*, Sir Andrew Duncan, chairman of the Central Electricity Board, and Mr. Archibald Page, chief engineer and manager, left England on Saturday last on a visit to Canada and the United States for the purpose of investigating the present development in electricity supply in North America.

Mr. G. R. Ferguson Strachan, until recently with the Hotpoint Electric Appliance Co., has been appointed as London representative for the Electrical Department of Carron Company.

A London paper reports that Mr. Allan Grant, assistant district engineer with the Clyde Valley Electric Power Co., has been appointed district engineer to the Grampian Electricity scheme works.

Three new directors have joined the board of Major & Co., Ltd.:—Admiral Sir Sydney Fremantle, Mr. G. F. Wrigley (15 years with the company), and Mr. E. Hotham (17 years with the company).

Brigadier-General the Hon. Everard Baring, C.V.O., C.B.E., has joined the board of the London Electric Supply Corporation, Ltd.

*Indian Engineering* states that Mr. H. M. Price is appointed assistant electrical engineer, G.I.P. Railway.

**Obituary.**—Mr. G. D. Malcolm.—We learn with great regret of the sudden death of Mr. G. D. Malcolm, chairman of the Meter and Instrument Section of the Institution of Electrical Engineers. Mr. Malcolm was to have delivered his address to the Section to-day (Friday); the meeting has now been cancelled.

**Will.**—The late Sir J. Denison-Pender left £237,503 gross (and unsettled) and £210,131 net personalty.

# Financial Section.

**New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.**

## New Companies Registered.

**Electric Sweepers, Ltd.**—Private company. Registered April 22nd. Capital, £10,000 in £1 shares. Objects: To adopt an agreement with Sir Donald A. Makgill, Bt., and to carry on the business of agents for and dealers in mechanical appliances of all kinds, &c. The permanent directors are:—Sir John Donald A. A. Makgill, Bt., 48, Royal Avenue, Chelsea, S.W.3; R. J. R. H. Makgill, address not stated. Registered office: 405, Oxford Street, W.1.

**Faradex-Seraphone Co., Ltd.**—Registered as a public company April 24th. Capital, £125,000 in 2s. shares. Objects: To acquire as from March 30th, 1929, the businesses, goodwill, and assets (excluding book debts, cash in hand and in bank, and liabilities) (1) of Rooke Bros., Ltd., manufacturers of wireless receivers and other radio components, Cardington Street, Euston Road, N.W.1, together with patents covering "A new and improved method of coupling thermionic valves for the amplification of electrical impulses, &c.," and the trade mark "Faradex"; and (2) of the Seraphone Co., Ltd., manufacturers of wireless sets, &c., with the trade marks "Seraphone," "Daneaphone," and "Orkestraphone." The subscribers (each with one share) are:—H. A. Amos and J. W. Pummell, 39-41, New Broad Street, E.C., and five others.

Registered office: Friars House, 39-41, New Broad Street, E.C.2.

**Major, Newman & Sons, Ltd.**—Private company. Registered April 22nd. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, acoustical and general engineers, manufacturers of and dealers in wireless, acoustical, telegraphic, telephonic and electrical instruments, &c. The directors are:—Mrs. Lucy M. Pettitt, Cruickshank Lodge, Long Lane, Ickenham, Middlesex; Mrs. Alice B. L. Newman, 44, Halford Road, Hillingdon, Middlesex. Registered office: 34, College Road, Harrow, Middlesex.

**Personic, Ltd.**—Private company. Registered April 24th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio, television, and electrical apparatus, gramophones, phonographs, &c. The first directors are:—S. Spero, 9, Elgin Mansions, Maida Vale, W.9; and T. W. Rutter, 180, Norbury Crescent, S.W.16, radio manufacturers. Registered office: Peebles Works, Palmerston Road, Kilburn, N.W.6.

**Electro-Vortex, Ltd.**—Private company. Registered April 23rd. Capital, £5,000 in £1 shares. Objects: To carry on the business of patentees or manufacturers of plant relating to domestic laundry equipment, engineers, founders, dealers in electrical appliances, &c. The first directors are:—P. B. Mason, 9, St. Peter's Avenue, Knutsford, Cheshire, engineer (permanent managing director); W. Moreton, 18, Garden Road, Knutsford, chemist; A. U. Mason, 21, Hampstead Garden, Golder's Green, railway accountant. Solicitors: Sedgley, Caldecutt & Co., Knutsford.

**Everett's International Accumulators, Ltd.**—Private company. Registered April 24th. Capital, £1,000 in £1 shares. Objects: To acquire and experiment with patents, &c. The permanent directors are: G. R. Carr and C. H. Everett, addresses not stated; A. P. Evens, 168, Regent Street, W.1, accountant. Secretary: A. P. Evens. Registered office: Ulster Chambers, 168, Regent Street, W.1.

**Distributors (British Electrical), Ltd.**—Private company. Registered April 26th. Capital, £1,000 in 650 ordinary shares of £1 each, and 7,000 ordinary shares of 1s. each. Objects: To acquire the business of a ventilating, heating, and general electrical engineer, formerly carried on by E. E. Lee as "Distributors," at 25, Victoria Street, S.W.1. The permanent directors are: F. J. Mills, Hamley, 29, Sisters Avenue, Clapham Common, S.W.11; E. L. Lee, 24, Garbes Road, Forest Hill, S.E.23; C. H. L. George, 40, Colonial Avenue, Whitton, Twickenham. Registered office: 25, Victoria Street, S.W.1.

**Savoy Engineering Co., Ltd.**—Private company. Registered April 26th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers of and wholesale or retail dealers in wireless transmitting and receiving sets, component parts and accessories, gramophones, electrical apparatus, &c. The subscribers are: P. Wood, electrical engineer, and Mrs. L. P. Wood, both of 344, Green Lanes, Ilford. P. Wood is permanent managing director and chairman. Registered office: Woodbine Place, High Street, Wanstead, Essex.

# Official Returns of Electrical Companies.

**Gordon England, Ltd.**—Satisfaction (1) in full on various dates from February 13th to March 20th, 1929, of debentures dated March 3rd, 1927, securing £19,500; (2) to the extent of £1,000 on February 13th, and to the extent of £1,000 on March 20th, 1929, of debentures dated September 9th, 1926, securing £2,000; (3) in full on February 13th, 1929, of debentures dated July 8th, 1925, securing £4,500; (4) to the extent of £600 on February 22nd, and to the extent of £7,500 on March 20th, 1929, of debentures dated December 21st, 1928, securing £15,000 (of which only £12,100 was issued); and (5) in full on April 15th, 1929, of trust deed and charge dated October 25th, 1927, securing £117,500 debenture stock.

**L.P.S. Electrical Co., Ltd.**—Capital, £5,000 in £1 shares. Return dated December 31st, 1928. All shares taken up. £5,000 paid. Mortgages and charges, nil.

**General Cable Manufacturing Co., Ltd.**—Satisfaction to the extent of £1,600 on January 1st, 1929, of debentures dated June 30th, 1928, securing £41,400.

**Edison Swan Electric Co., Ltd.**—Capital, £432,565 8s. in 100,000 preference shares of £1 each and 1,662,827 ordinary shares of 4s. each. Return dated January 11th, 1929. 100,000 preference and 957,177 ordinary shares taken up. £223,185 8s. paid (being £1 per share on 100,000 preference, 8d. per share on 284,646 ordinary, 1s. 7 1/5d. per share on 26,415 ordinary and 4s. per share on 554,530 ordinary. £68,928 considered as paid (being 3s. 4d. per share on 284,646 ordinary, 2s. 4 4/5d. per share on 26,415 ordinary and 4s. per share on 91,586 ordinary). (£452 in arrears.) Mortgages and charges, £494,109.

**W. Robson & Sons, Ltd.**—Capital, £500 in £1 shares. Return dated December 31st, 1928 (filed April 12th, 1929). 400 shares taken up. £300 paid. £100 considered as paid. Mortgages and charges, £600.

**John Belton & Co., Ltd.**—Capital, £3,000 in £1 shares. Return dated April 23rd, 1928 (filed April 6th, 1929). All shares taken up. £3,000 paid. Mortgages and charges, nil.

**Unity Lamp and Accessories, Ltd.**—Capital, £4,500 in 3,000 ordinary and 1,500 deferred shares of £1 each. Return dated April 2nd, 1928 (filed March 30th, 1929). 2,500 ordinary and 1,500 deferred shares taken up. £1,925 paid (being 17s. 6d. per share on the ordinary). £1,500 considered as paid on the deferred shares. Mortgages and charges, £1,515.

**Electric Services (Liverpool), Ltd.**—Capital, £1,000 in £1 shares. Return dated December 31st, 1928 (filed April 3rd, 1929). 152 shares taken up. £152 paid. Mortgages and charges, nil.

**Prince's Electrical Clocks, Ltd.**—Capital, £3,000 in £1 shares. Return dated January 17th, 19.9. All shares taken up. £1,000 paid. £2,000 considered as paid. Mortgages and charges, nil.

**N.E.C., Ltd.**—Capital, £1,000 in 900 preference and 100 ordinary shares of £1 each. Return dated December 31st, 1928 (filed April 17th, 19 9). 175 preference and 60 ordinary shares taken up. £95 paid on 35 preference and 60 ordinary shares. £140 considered as paid on 140 preference shares. Mortgages and charges, nil.

# City Notes.

### British Thomson-Houston Co., Ltd.

The report for the year ended December 31st, 1928, records a total profit of £422,729, as compared with £462,444 in 1927. A balance of £200,513 brought forward makes available £623,242. After providing for debenture and loan interest, depreciation (£119,451) and preference dividends, it is proposed to pay a dividend of 4 per cent. on the ordinary shares, leaving £203,066 to be carried forward. No ordinary dividend was paid in respect of 1927. The report records the death of Mr. O. H. Smith, a director since 1902, and goes on to state that competition at home and abroad continued to keep prices at unreasonably low levels. The volume of factory output was comparable with that of the preceding year, but the profits remained unsatisfactory. The preliminary arrangements with several manufacturing companies referred to in the last annual report have now become effective. Associated Electrical Industries, Ltd., has purchased all the shares owned by the company in the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd., and paid cash therefor. Associated Electrical Industries, Ltd., has also acquired from their respective owners all the ordinary shares of the company, so that the preliminary arrangements mentioned in the last annual report have now come to a satisfactory conclusion, and steps are being taken to put into effect as rapidly as possible the economies and co-operative efforts which are the object of the arrangements. The loans which at December 31st, 1927, stood at £1,310,000 have been reduced to £335,000, the proceeds of the sale of shares of the Edison Swan and Ferguson Pailin companies having been used for the purpose of making this reduction. Also the amount for shares in affiliated companies which at December 31st, 1927, stood at £989,402 has now disappeared, and the amount for shares and debentures in lighting, traction and other companies has been reduced from £516,352 to £369,638. In 1915 a suit was brought against the company for the alleged infringement of certain patents. After litigation lasting several years, the House of Lords finally delivered a decision against the company, and the balance of the liability was deducted before the amount available from the last financial year was carried to this year's balance sheet. The entire liability extends over a period of years; it has nothing to do with the current year's operations, and therefore it is taken out of the carry forward rather than out of the profits for the current year. Maj.-Gen. Sir Philip A. M. Nash has been appointed a director since the last general meeting and offers himself for re-election at the annual meeting on May 8th.

### Reading Electric Supply Co., Ltd.

The profit for the year ended December 31st, 1928, amounted to £54,251, as compared with £53,118 for 1927. After providing for debenture interest, depreciation, &c., and adding £5,406 brought forward, there is an available balance of £24,977, which it is proposed to deal with as follows:—To investments reserve account, £408; to debenture stock redemption fund, £1,500; dividend of 10 per cent. (the same); carrying forward £6,177. The sale of energy rose by 3,018,020 kWh to 11,379,131 kWh. The first of the new 3,750-kW sets was in operation throughout the year and the other has now been placed in commission.

### South Wales Power Co., Ltd.

The annual meeting was held on April 26th, Mr. W. North Lewis (chairman) presiding. In presenting the report and accounts (*vide* ELECTRICAL REVIEW, April 19th, p. 710) the chairman said the past year was one of the worst ever experienced in the coal trade in South Wales. Many of the collieries

taking their power from the company were temporarily closed down, many were working short time, and some had gone into liquidation and had changed hands. This had meant a serious curtailment of demand from some of the largest consumers. To meet the position a policy of lower prices and simpler tariffs had been adopted, with the result that the fall in output as compared with 1927, only amounted to 7 per cent. Since the beginning of the year there had been a considerable improvement in the coal trade, and this was reflected in a marked degree in the curve of output. In the company's Electric Lighting Order areas, the results had been much better. The number of consumers had increased by 18 per cent., the electricity sold by 11 per cent., and the revenue by 12 per cent. The total length of l.p. distributing mains had increased by 18¼ per cent., and the capital expenditure in the company's electric lighting areas by 15 per cent. Although the output was reduced, the efficiency of production improved, the coal used per kWh falling from 1.701 lb. to 1.61 lb. The erection of a 25,000-kW set at Treforest was nearing completion. The report and accounts were adopted.

### Shanghai Electric Construction Co., Ltd.

The report of the directors for the year ended December 31st, 1928, shows a profit of £165,172 (as compared with £96,571 in 1927); to this is added £11,656 brought forward, making £176,828. This is to be allocated as follows:—Renewals, £50,000; taxation, £25,000; reserve, £25,000; staff provident fund, £2,299; dividend of 12½ per cent., free of tax (5 per cent. already paid); carried forward, £12,028. The Singapore Traction Co., Ltd., in which the company is interested, has been authorised to make certain extensions of its system. As managers, the company participated to the extent of £10,000 in the Singapore Company's profits; the prospects for the current year are satisfactory.

At the meeting on Wednesday last a resolution was to be submitted increasing the capital by the creation of 200,000 new shares of £1 each and the issue of 100,000 as fully paid (by way of capitalisation of profits) to existing shareholders in the proportion of one new share to each five held. The remaining 100,000 will be held in reserve for issue at some future date.

### Bournemouth and Poole Electricity Supply Co., Ltd.

The accounts for 1928 show a capital expenditure during the year of £55,468. The balance on revenue account is £170,382 (against £160,074), and to it is added £7,290 brought forward, making £177,672. From this are deducted debenture interest, redemption fund instalments, depreciation, renewals, &c. (£35,000), reserve for taxation (£6,000), and general reserve allocation (£25,000). As already reported, the final ordinary dividend is 9 per cent., again making 15 per cent. for the year. The sales of energy rose from 12,237,993 to 13,366,746 kWh. During the year substantial reductions were made in the rates for all classes of supply. Negotiations with the local authorities in connection with the extension of the company's tenure are still proceeding. Interests have been acquired in other supply undertakings in the district and sanction is awaited to an application for an additional area. Application is to be made to the Electricity Commissioners for permission to erect a new station on the site already acquired at Poole. In May last year the board capitalised £360,000 of the reserves and distributed it as a share bonus to the ordinary shareholders. Meeting: To-day (Friday).

### Associated Electrical Industries, Ltd.

The first report of this company (formerly the Metropolitan-Vickers Electrical Co., Ltd.), covering the past year, records a profit of £258,772. After providing for debenture interest, depreciation and general reserve (£25,000) and adding £99,676 brought forward, there is an available balance of £235,339. It is proposed to pay a dividend of 6 per cent. on the ordinary shares and to carry forward £101,850. The figures apply to the company's trading results only; no account is taken of dividends from the associated companies. The report states that the output from the company's works reached a record volume, and the orders in hand are maintained at a satisfactory level. Competition was exceptionally severe and price levels correspondingly low. Meeting: May 7th at Bush House, W.C.2.

### Indo-European Telegraph Co., Ltd.

Presiding at the annual meeting on April 25th, Mr. H. L. M. Tritton (chairman) said that the company's lines worked efficiently during the year. The average times of transmission between Karachi and London, as well as on the company's other main circuits between London, the Continent, and Persia and India, were satisfactory, and the record for accuracy had been maintained. During the year under review arrangements were made in co-operation with the Indo-European Telegraph Department, for the installation of regenerators at various points on the line. The system was actually in operation on one line, in both directions, between London and Karachi, and had produced a very material increase in speed. The report and accounts were adopted.

### North Somerset Electric Supply Co., Ltd.

During the past year the company's capital was increased to £250,000 by the creation of 100,000 ordinary shares, of which 50,000 were offered at par to existing shareholders. The purchase of shares in the Winscombe and Cheddar companies has proved advantageous; these companies have been wound up and merged in the company's accounts. The shares in the non-statutory undertaking at Wedmore have been purchased. The sales of energy rose from 4,243,364 to 6,329,109 kWh. The accounts for the past year show a net profit of £17,585 (against £13,983). The ordinary shares have received a dividend of 7 per cent.; £1,000 is provided for obsolescence and £1,000 for general reserve, leaving £1,572 to be brought forward.

### Clyde Valley Electrical Power Co.

At an extraordinary general meeting on April 24th resolutions were passed cancelling the unissued balance of 200,000 cumulative second preference shares of £1 each, and sanctioning the issue of the unissued balance of share capital to the amount of £900,000 in the form of ordinary shares of £1 each, to be offered at par to the ordinary shareholders of the company in the proportion of three new shares for each four held.

### Babcock & Wilcox, Ltd.

The annual meeting was held on April 24th. Sir John Dewrance (chairman), who presided, said that during the past year the company had spent on bringing its plant up to date a sum of money which was in excess of the capital of the company at the time he was appointed chairman 30 years ago. The result of that was that the company at the present time was in a good position to execute all the orders that it had in hand or could book immediately. For some time past there had been difficulty in executing orders as rapidly as customers had wished, but it could be safely said now that the company would be able to give very much better delivery than it had in the past. The associated companies had been very successful during the year, particularly the Spanish company, which had for some time not been showing such good results. This year it had given a splendid result. During the year competition seemed to have been extremely severe. There were signs that the trade of the country was improving, particularly in shipbuilding and in a variety of directions. The report and accounts were adopted.

### Companies Struck Off the Register.

The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved:—

Accumulators (Birmingham), Ltd.
Advance Wireless, Ltd.
Atlas Wireless Co., Ltd.
Cambrian Electrolytic Zinc Co., Ltd.
Cooke & Whitfield Wireless, Ltd.
Electrical and Allied Instrument Mfg. Co., Ltd.
Electrical Specialities, Ltd.
Farndons Electric, Ltd.
Houghton's Electrical Engineering Co., Ltd.
J. H. Runbaken, Ltd.
Magnetic Transmission Co., Ltd.
Thor Electric Safety Lamp Co., Ltd.
Vauxhall Electrical Mfg. Co., Ltd.
Woodhall Wireless Mfg. Co., Ltd.

### Ever-Ready Co. (Great Britain), Ltd.

The directors state that the net profit for the year ended March 31st last amounted to £210,167, against £187,963 for 1927-28. They propose to pay a final dividend of 5 per cent. on the preference shares, making the maximum of 10 per cent. for the year. The final dividend on the old ordinary shares will be 25 per cent., again making 35 per cent. for the year, and on the bonus ordinary shares there will be a distribution of 25 per cent.

### La Plata Electric Tramways Co., Ltd.

The gross receipts for the past year amounted to £114,686 and the net receipts to £29,478 (against £31,463); the addition of £4,641 brought forward makes available £34,119. After providing for debenture interest, &c., it is proposed to allocate £8,000 to the renewals fund and to pay 7½ per cent. on the 6 per cent. cumulative preference shares, representing the year's dividend and 1½ per cent. off arrears. The balance carried forward is £5,190. Meeting: May 8th.

### Cammell, Laird & Co., Ltd.

Presiding at the annual meeting on April 23rd, Mr. W. L. Hichens (chairman) said that he had seen statements made in the Press that at some time the company would have to reconstruct. In his opinion, the company stood in no need of financial reconstruction. It would gain nothing thereby, and might be prejudiced when prosperous days returned. The prosperity would not come at once. Reorganisation on a large scale took a long time to carry out, and it must necessarily be some years before the full benefits were enjoyed. The report and accounts were adopted.

### Para Electric Railways and Lighting Co., Ltd.

The annual meeting was held on April 22nd, Sir Francis M. Voules (chairman) presiding. In moving the adoption of the report and accounts, the chairman said that he had noticed considerable fluctuations in the value of the company's shares.

which had been based on the prospect of receiving a favourable offer from some American group. It was true that they had been approached by an important American group which had sent representatives to Para, but, while he would not say that there was no prospect of an offer being received, up to the present no offer had been made. The most hopeful feature for the future was that the State of Para appeared to be grappling with the disaster that overtook it when it ceased to have command of the world's supply of rubber. The report and accounts were adopted.

### Rangoon Electric Tramway and Supply Co., Ltd.

After allocating £58,500 to renewals reserve and £4,000 to cables reserve, the net profit for 1928 is £58,058, against £60,326. The ordinary dividend is maintained at 1 rupee 12 annas for the year, and £20,624 is carried forward (against £24,232 brought in). Although the car-mileage increased during the year, there was a decline in the number of passengers carried. The sales of electrical energy, however, showed an advance.

### Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted :—

American Telephone and Telegraph Company.—$2,004,200 capital stock.

Pinchin, Johnson & Co.—2,069,934 ordinary shares of 10s. each, fully paid, Nos. 689,979 to 2,759,912.

Scottish Power Company.—600,000 ordinary shares of £1 each, fully paid, Nos. 750,001 to 1,350,000.

Underground Electric Railways Company of London.—10,731 ordinary shares of £1 each, fully paid, Nos. 7,102,637 to 7,113,367.

### Hopkinsons, Ltd.

Presiding at the annual meeting on April 26th, Mr. R. A. Hopkinson (chairman) said that, following on the use of that company's electrical signal indicators in mines, they were being introduced in power stations. During the past year the company had been fully occupied in the manufacture of its patent electric valve controls, for which it had several months' orders still in front of it. With the higher pressures in boilers, safety valves had again become a very important adjunct, and at the present time over 1,000 safety valves were on order. The report and accounts were adopted.

### West London and Provincial Electric and General Trust, Ltd.

The annual meeting was held on April 26th, Mr. H. Kahn (chairman) presiding. In presenting the report and accounts, the chairman said that, although the company had disposed of a further part of its holding in the Chiswick Electricity Supply Corporation, it still retained a comparatively large holding. The company had little to fear from the aftermath of the wave of speculation that had been going on for the last year, or from the uncertainties consequent on the coming General Election. The report and accounts were adopted.

### Richmond (Surrey) Electric Light and Power Co., Ltd.

The balance on the 1928 revenue account (including £2,190 brought forward) was £48,677, against £42,573 in 1927. After providing for debenture interest, depreciation and renewals, taxation and general reserve (£10,000), there is an available balance of £26 281. The directors recommend a final dividend of 7 per cent. on the ordinary shares, making 11 per cent. for the year (against 10 per cent.), and £4,281 is carried forward. The amount of energy sold was 3,567,931 kWh, as compared with 3,142,103 kWh in 1927. Meeting: To-day (Friday).

### Prospectus.

*Faradex-Seraphone, Ltd.*—On Tuesday last this company offered for subscription 750,000 shares of 2s. each at par. The total capital is £125,000 in 1,250,000 2s. shares, and of these 350,000 have been allotted to the vendors as fully paid. The company has acquired the businesses, patents, &c., of Rooke Bros., Ltd., and the Seraphone Co., Ltd., manufacturers of radio receivers and apparatus and gramophones. Particulars of registration are given on p. 796 of this issue.

### The Cable Wireless Merger.

It is anticipated that the terms of the offer by Cables and Wireless, Ltd., for the exchange of their holdings will be posted to the stock and shareholders of the cable companies and the Marconi company on May 7th.

### City of Buenos Ayres Tramways Co. (1904), Ltd.

A dividend of 1s. 3d. per share has been declared in respect of the three months ended March 31st.

### Craigpark Electric Cable Co., Ltd.

The ordinary dividend for the past year is 5 per cent., against 4 per cent. for 1927-28.

### S. Smith & Sons (Motor Accessories), Ltd.

An interim dividend of 5 per cent. has been declared on the preferred ordinary shares.

# Stocks and Shares.

MONDAY EVENING.

MARKETS in the Stock Exchange show an irregular tendency which is due, in the main, to the spasmodic character of business as a whole. One day will witness a fair amount of activity; on the next day there may be nothing doing. When business is quiet, the tendency is nearly always dull. With absence of speculation noticeable in most departments, public disposition is to place capital into gilt edged and first-rate securities for the time being, leaving other and more risky enterprise until such time as the outlook becomes a little clearer politically and financially.

### Eastern Telegraph Group.

The three cable companies, the Eastern Telegraph, the Eastern Extension and the Western close their transfer books on the Tuesday of this week until May 21st, preparatory to obtaining from the holders of their ordinary stocks an expression of their willingness to join the Cables & Wireless, Limited, merger, about which so much has been written of late. It was mentioned here last week (on page 753) that the offer of Cables & Wireless, Limited, is conditional upon its acceptance by 60 per cent. (or such smaller percentage as may be approved by the Government) of the ordinary shareholders of the cable companies, together with the three classes of shareholders in the Marconi Company.

We may add that it will be necessary for shareholders in each cable company to give the necessary proportion of consent for the plan to be operative. That is to say, it will be no use for the Eastern Telegraph stockholders assenting as to, say, 100 per cent., and for the Western shareholders to assent by only 50 per cent. There can be little doubt as to the willingness of the cable companies' shareholders to acquiesce in the proposals now made to them. Prices are a trifle lower, Eastern ordinary and Westerns both showing declines, but Globes have risen 5s. to 28¼.

### Marconi Shares.

With the Marconi Company the 60 per cent. assent is required from the three classes of shareholders taken, for this purpose, as one. Doubtless the proprietors of Marconi 10s. shares will provide, by themselves, the full proportion required, so the holders of the £1 ordinary and the 7 per cent. preference shares may deem it wise to accept the situation as it stands, throwing in their lot with the predominant class and deferring until a later date their claims to extra consideration. Marconi 10s. shares are better, at 85s. The £1 ordinary shares, after being 5¼, reverted to 5, at which price support came in. The 7 per cent. preference are also 5 Canadian Marconis remain at 32s. 6d.

### Indo-European and the Soviet.

Great Northern Telegraphs have shed another 10s., coming back to 33. Indo-Europeans are firm at 55½ on the meeting held last week, when the chairman reminded his audience of his warning a year ago; namely, that the company's revenue would be bound to show diminution by reason of the beam wireless competition. Shareholders, he added, would appreciate that the full measure of prosperity enjoyed in recent years might not be so easy of realisation in the future. He referred to an exceptional interruption caused in the Crimea by a blizzard last February, when the Soviet Government came to the rescue by placing its wires at the company's disposal. The Soviet Government so rarely receives a word of approval that impartiality notes with interest this unexpected tribute to its capacity for friendliness upon occasion. American Telephone and Telegraph at 240, and International Telephone and Telegraph at 265 are below their recent best prices. Cuban Telephone Fives at 97½ and United River Plate 4½ per cent. debenture show gains of a point apiece

### The " Dollar " Stocks.

The International Holding and Investment Company, in its report for the period to the end of last December, shows net revenue of $6,900,000, which excludes an exceptional profit of a little over 13 million dollars. A transfer of five million dollars to the investment account is made by way of provision for depreciation as at December 31st, 1928. This left $142,000 in the surplus account. The non-recurring profit of 13 million dollars has been dealt with by a transfer of about half of it to capital account, the balance remaining unappropriated in the surplus account, which latter now amounts to 6½ million dollars. The price of the shares is dull, at 7½, and so is that of Hydro Electrics, at 34¾. Hydros derived no benefit from the issue of the report, of which the salient figures were given here last week. Brazilian Tractions are now quoted ex dividend at 59½. In the Mexican group, the only change of any consequence is a fall of 7 points in Mexican Light & Power common shares, lowering the price to 77½. The 7 per cent. preferred shares have recovered to 75½ ex dividend, the interest payment being taken off the price last week. Anglo-Argentine Tramways 5 per cent. debenture stock strengthened to 74½. British Columbia A and B shares are 49 and 31, respectively. After dipping to 77½, Shawinigan Water rallied to 78¼. Toronto Power 4½ per cent. guaranteed stock, the price of which moves but rarely, is better at 95½.

## Home Electricity Supply.

The yield on the money offered by investment in home electricity companies' shares makes a better showing this week by reason of the fact that a number of prices were quoted ex dividend at the last Stock Exchange account-day, April 24th. Some of the deductions have been partially recovered already. County of London ordinary at 55s. have regained the dividend and 6d. per share in addition. City of London ordinary are 1/16 up at 33s. 3d. Bournemouth and Poole are unchanged at 64s. 6d. on the announcement of a dividend of 15 per cent., the same rate as that of a year ago, when the capital was exactly half its present amount. The company has enjoyed a remarkably good year, and the dividend has been maintained at the full rate without unduly trenching upon allocations. Shropshire, Worcestershire and Staffordshire "B" are better at 38s. 9d. Midland Electric Power shares are a little easier at 35s. 9d. Richmond Electrics hardened on the announcement of a final dividend of 7 per cent., making 11 per cent. for the year, an increase of 2 per cent. over the 1927 distribution. South Wales Power preference are unchanged at 1; the company's report reflects the depression in the South Wales coal trade. It is thought that the outlook for 1929 is definitely brighter.

## New Issues.

Clyde Valley shares are quoted this week ex the rights to the new issue. The price is 32s. 6d., and the new shares, with nothing paid, are 12s. premium over their par value of £1. The market is not very flexible, owing in part to the fact that a good many allottees intend to take up their proportion of the new shares. If the company is able to continue payment of the 8 per cent. dividend on the whole of the increased capital, Clyde Valley shares may be accounted reasonably-priced at their present level. Other fresh shares marketed this week are Lancashire Electric new, the issue of which appears to have been fairly heavily stagged, judged by the modest premium, 3d. to 6d., at which the price developed.

## Egham and Staines.

The Egham and Staines Electricity Company requires that applications for the new ordinary shares that are being offered at 30s. per share, shall be completed and returned before noon on Saturday at the end of this week. The shares will rank for dividend as from June 1st this year. They are not issued *pro rata*, and, for this reason, it is likely that some of the shareholders will fail to take advantage of the opportunity offered to them for obtaining cheap shares. When people are allowed to apply for as many shares as they like, instead of being allotted a fixed proportion which they may or may not accept, as they please, the Stock Exchange cannot quote the "rights" as being of any fixed value, and the method adopted by the Egham and Staines Company may result in some of the shareholders neglecting their right to apply at 30s. The issue of the shares has been underwritten for a commission of 1s. 6d. per share, which looks extravagant in view of the fact that the price was standing at 35s. before the new issue was made.

## Associated Electric Excitement.

Excitement, inspired by American buying and fanned by speculative support on this side, has been again a feature in Associated Electric shares. The price rose 9s. 3d. last week to 47s. 6d.; it jumped to 57s. on Monday morning in this week; and is now, at the time of writing, about 53s. 9d. middle. Curiosity remains on edge to learn what may be the reason for this violent demand on the part of New York purchasers, and all kinds of guesses are offered in explanation of it. At least some of the buying is said to come from the sources identified with the recent American appetite for General Electrics. The latter were rushed up, it may be recalled, to 4¼ before the incidents occurred that ended in the withdrawal of the proposed new issue of shares. General Electrics have been under 3 since they reached 4¼. At 3⅛ the price shows ¼ decline as compared with a week ago.

## Miscellaneous.

Babcock & Wilcox are 3 9/16 ex dividend. The chairman stated at the meeting the other day that the company at the present time is in a very good position to execute all the orders in hand, or that it can book immediately. He referred to the associated companies as having been very successful last year, particularly the Spanish Company, which in 1928 gave a very good account of itself. Signs of improvement in British trade, particularly in ship-building, were manifest, though competition last year seemed to have been extremely great.

Enfield Cable ordinary shares are better at 4 5/16; the new ordinary at 4¼ also show improvement. English Electrics, both ordinary and preference, are flat, giving way to 6s. 3d. and 8s. 3d., respectively. India Rubber shares hardened to 13s. 9d. Ever-Ready shares are steady at 23s. 6d., upon the declaration of the same dividend as before, making 35 per cent. for the year in the case of the old shares. The company's figures are exceedingly good. Atlas Power 7 per cent. preference have hardened to 23s. 9d. In the Australian list, Adelaide Electric Supply 6½ per cent. preference lost a few pence at 23s. 6d. The engineering group of shares is dull on lack of business, and rubber shares are heavy because of a decline in the raw product to a shade below 10d. per lb.

# Share List of Electrical Companies.

### Home Electricity Companies.

| | Nom. | Approx. Dividend. 1927. | 1928. | Price April 29 1929. | Rise or fall | Yield p.c. |
|---|---|---|---|---|---|---|
| | £ | | | | | |
| Bournemouth and Poole ... ... ... | 1 | 15 | 15 | 64/6 | — | 4 13 0 |
| Brompton Ordinary ... ... ... | 1 | 8½ | 8½ | 26/-xd | — | 5 7 8 |
| Charing Cross Ordinary ... ... | 1 | 8½ | 8½ | 26/- | — | 5 7 8 |
| do. do. 4½% Pref. ... | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Chelsea ... ... ... ... ... | 1 | 8⅞ | 8⅞ | 26/-xd | — | 5 7 8 |
| City of London ... ... ... | 1 | 10 | 10 | 33/3 | +1/16 | 4 4 6 |
| do. do. 6% Pref.... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| Clyde Valley ... ... ... ... | 1 | 8 | 8 | 32/6xr | — | ... ... |
| County of London ... ... ... | 1 | 7½ | 10 | 55/-xd | +1/8 | 3 12 9 |
| do. do. 6% Pref.... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| Edmundson's 7% Pref. ... ... | 1 | 7 | 7 | 24/6 | —6d. | 5 14 8 |
| Elec. Supply Corporation ... ... | 1 | 11 | — | 56/3 | +1/16 | 8 18 3 |
| Kensington Ordinary ... ... | 1 | 8 | 8 | 26/6 | — | 5 5 8 |
| Lancs. Light and Power ... ... | 1 | 7½ | 7½ | 29/- | — | 5 3 6 |
| London Electric ... ... ... | 1 | 8½ | 9 | 27/- | — | 5 3 8 |
| Metropolitan ... ... ... ... | 1 | 9 | 9 | 2½/- | — | 4 7 4 |
| do. 4½% Pref. ... ... | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Midland Counties ... ... ... | 1 | 6½ | 6½ | 28/- | — | 4 12 10 |
| Mid. Elec. Power ... ... ... | 1 | 15 | 8 | 35/9 | —6d. | 4 9 6 |
| Newcastle on-Tyne Ordinary ... | 1 | 6 | 6 | 1¾xd | — | 4 16 0 |
| do. 7% Pref. ... ... | 1 | 7 | 7 | 26/- | — | 5 7 8 |
| Notting Hill 6% Pref. ... ... | 10 | 6 | 6 | 10⅜ | — | 5 11 7 |
| North Met. Elec. 6% Pref. ... | 1 | 6 | 6 | 23/-xd | +6d. | 5 4 4 |
| St James' and Pall Mall ... ... | 1 | 8 | 8 | 26/6xd | — | 5 1 10 |
| Scottish Power ... ... ... | 1 | 8 | 8 | 31/- | — | 5 3 3 |
| South London ... ... ... ... | 1 | 8½ | 8½ | 26/6xd | — | 5 5 8 |
| Urban Ordinary ... ... ... | 1 | 7 | — | 43/3 | — | ... ... |
| Westminster Ordinary ... ... | 1 | 8½ | 8½ | 26/- | — | 5 7 8 |
| Whitehall Elec. Invst. 7½% Pref.... | 1 | 7½ | 7½ | 24/- | — | 6 5 0 |
| Yorkshire Elec. ... ... ... | 1 | 8 | 8 | 34/- | — | 4 14 2 |

### Home Rails.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented ... | Stock | 4 | 4 | 72 | — | 5 11 1 |
| Metropolitan ... ... ... ... | ,, | 3 | 3½ | 60½ | — | 5 15 8 |
| do. District ... ... ... | ,, | 4 | 5 | 76 | — | 6 11 7 |
| Underground Electric ... ... | £1 | 5 | 7 | 23/6 | — | 5 13 10 |
| do. do. Income ... | Bonds | 6 | 6 | 112 | —1 | 5 7 3 |

### Telegraphs and Telephones.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 103½ | — | 5 17 1 |
| do. Def. ... ... ... | ,, | 1½ | 1½ | 24½ | — | 6 2 6 |
| Automatic Telephone ... ... | 1 | 10 | 12½ | 2½ | — | 5 18 0 |
| Eastern Extension ... ... ... | 10 | 10 | 10 | 28 | — | *3 11 5 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 280 | —2 | *3 11 5 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 28½ | +¼ | *3 11 0 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 11¼ | — | 5 9 0 |
| Great Northern Tel. ... ... | 10 | 20 | — | 33 | —½ | ... ... |
| Indo-European ... ... ... | 25 | 10 | 10 | 55½ | — | *4 10 0 |
| Marconi ... ... ... ... | 10/- | 10 | — | 4¼ | —1/16 | ... ... |
| Marconi-Marine ... ... ... | 1 | 12½ | 15 | 8¼ | — | 4 12 4 |
| Oriental Telephone Ord. ... ... | 1 | 12 | 12 | 2⅞ | — | ... ... |
| Western Telegraph ... ... ... | 10 | 10 | 10 | 27½ | —⅛ | 3 12 9 |

### Home and Foreign Trams, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams First Pref. ... | 5 | 5½ | 5½ | 3⅜ | — | 7 11 6 |
| do. do. 2nd Pref. ... | 5 | 6 | 6 | 3 1/16 | — | 7 19 0 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 71½ | +2 | 6 14 3 |
| British Electric Traction Def. Ord. | ,, | 5 | — | 850 | — | ... ... |
| do. do. Pref. Ord. | ,, | 8 | 8 | 138 | — | 6 5 0 |
| Brazil Traction ... ... ... | 100 | 7 | 8 | 59½xd | — | 3 7 3 |
| Brit. Columbia Elec. Rly. Pcc. ... | Stock | 5 | 5 | 95½ | — | 5 1 7 |
| London & Sub. Trac. 5% Pref. ... | 1 | Nil | Nil | 12/6 | +6d. | ... ... |
| London United Tram Deb. ... | Stock | 4 | 4 | 61 | — | 6 11 4 |
| Mexico Trams, 5% Bonds ... ... | — | 5 | 5 | 71½ | — | 6 19 10 |
| Mexican Light Common ... ... | 100 | Nil | Nil | 7¾ | —7 | ... ... |
| do. 7% Pref. ... ... ... | 100 | 7 | 7 | 75½xd | +2½ | 9 5 6 |
| do. 1st Bonds ... ... ... | — | 5 | 5 | 77½ | — | 6 9 0 |
| Yorkshire (West Riding) ... ... | 1 | Nil | Nil | 5/- | — | ... ... |

### Manufacturing Companies.

| | | 1926. | 1927. | | | |
|---|---|---|---|---|---|---|
| Assoc. Elec. Ord. ... ... ... | 1 | — | 6 | 53/9 | +6/3 | 2 4 9 |
| Babcock & Wilcox ... ... ... | 1 | 13 | 15 | 3 9/16xd | — | *4 4 3 |
| British Aluminium Ord. ... ... | 1 | 10 | 10 | 49/4 | +1/16 | *4 1 0 |
| British Elec. Transformer Pref. ... | 1 | 7 | 7 | 15/- | — | 9 6 8 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 4⅜ | — | 3 8 0 |
| Brush Ord. ... ... ... ... | 1 | 10 | 10 | 27/6 | — | 7 5 6 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 4⅜ | — | 3 9 0 |
| do. 6½% Pref. ... ... | 1 | 6½ | 6½ | 1¼ | — | 5 4 0 |
| Crompton Parkinson Ord. ... ... | 5/- | — | — | 1 | — | ... ... |
| do. 8% Pref. ... ... ... | 1 | — | 8 | 25/- | — | 6 8 0 |
| Edison-Swan 1st Pref. ... ... | 1 | 7½ | 7½ | 25/9 | — | 7 1 2 |
| do. 5% Deb. ... ... | Stock | 5 | 5 | 86½ | — | 5 15 7 |
| Electric Construction ... ... | 1 | 7½ | 7½ | 1 | — | 7 10 0 |
| Enfield Cable Ord. ... ... ... | 1 | 20 | 20 | 4 5/16 | +1/8 | 4 13 0 |
| English Electric ... ... ... | 1 | Nil | Nil | 6/8 | — | ... ... |
| do. do. Pref. ... ... | 1 | 8 | Nil | 8/8 | — | ... ... |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 24/- | —6d. | 5 8 4 |
| do. Ord. ... ... ... | 1 | 7½ | 10 | 3⅜ | —⅛ | 3 4 0 |
| Henley... ... ... ... ... | 1 | 25 | 25 | 6 | — | 4 1 8 |
| do. 4½% Pref. ... ... ... | 5 | 4½ | 4½ | 4½ | — | 5 6 0 |
| India-Rubber ... ... ... ... | 1 | Nil | Nil | 13/9 | +1/16 | ... ... |
| Johnson & Phillips ... ... ... | 1 | 12½ | 10 | 36/3 | — | 5 10 4 |
| Siemens Ord. ... ... ... ... | 1 | 7½ | 7½ | 1⅜ | — | 5 9 1 |
| Telegraph Construction ... ... | 12 | 10 | 10 | 24½ | — | *4 19 3 |

* Dividends paid free of Income Tax.

# The Electrical Imports of India.

## Principal Sources of Supply.

FULL details of India's import trade in 1927-28 in electrical goods, showing the principal countries of supply, have recently been issued. From these the following particulars have been extracted. The corresponding figures for 1926-27 have been added for purposes of comparison and a note of increases or decreases given :—

| | 1926-27. Rs. (Thous.) | 1927-28. Rs. (Thous.) | Inc. or dec Rs. (Thous.) |
|---|---|---|---|
| *Control and switchgear—* | | | |
| Total | 3,240 | 3,650 | + 410 |
| From United Kingdom | 2,900 | 3,120 | + 220 |
| „ United States | 169 | 336 | + 167 |
| *Generators, alternators and dynamos—* | | | |
| Total | 4,942 | 3,810 | −1,132 |
| From United Kingdom | 4,500 | 3,445 | −1,055 |
| „ United States | 270 | 120 | − 150 |
| „ Switzerland | 8 | 23 | + 15 |
| „ Germany | 150 | 135 | − 15 |
| „ Italy | 5 | 23 | + 18 |
| *Motors—* | | | |
| Total | 2,935 | 3,540 | + 605 |
| From United Kingdom | 2,327 | 2,870 | + 543 |
| „ United States | 373 | 386 | + 13 |
| „ Sweden | 15 | 9 | − 6 |
| „ Germany | 134 | 173 | + 39 |
| „ Switzerland | 11 | 23 | + 12 |
| „ Italy | 24 | 19 | − 5 |
| *Transformers—* | | | |
| Total | 2,304 | 1,160 | −1,144 |
| From United Kingdom | 1,679 | 941 | − 738 |
| „ United States | 505 | 130 | − 375 |
| „ Germany | 105 | 27 | − 78 |
| „ Italy | — | 17 | + 17 |
| „ Holland | 4 | 13 | + 9 |
| *Turbo-generator sets—* | | | |
| Total | 771 | 180 | − 591 |
| From United Kingdom | 677 | 153 | − 524 |
| „ Germany | 2 | 1 | − 1 |
| „ United States | 76 | 5 | − 71 |
| *Other electrical machinery—* | | | |
| Total | 8,744 | 7,670 | −1,074 |
| From United Kingdom | 6,519 | 6,117 | − 402 |
| „ United States | 873 | 483 | − 390 |
| „ Switzerland | 7 | 64 | + 57 |
| „ Germany | 568 | 460 | − 108 |
| „ France | 30 | 24 | − 6 |
| „ Italy | 48 | 78 | + 30 |
| „ Belgium | 242 | 330 | + 88 |
| *Electric fans and parts—* | | | |
| Total | 3,187 | 3,390 | + 203 |
| From United Kingdom | 2,121 | 1,834 | − 287 |
| „ Italy | 602 | 790 | + 188 |
| „ United States | 156 | 188 | + 32 |
| „ Germany | 278 | 550 | + 272 |
| *Wires and cables, rubber insulated—* | | | |
| Total | 3,035 | 3,323 | + 288 |
| From United Kingdom | 2,832 | 3,125 | + 293 |
| „ United States | 33 | 33 | — |
| „ Germany | 121 | 112 | − 9 |
| *Ditto, other insulation—* | | | |
| Total | 2,926 | 3,546 | + 620 |
| From United Kingdom | 2,611 | 3,125 | + 514 |
| „ United States | 144 | 224 | + 80 |
| „ Germany | 122 | 81 | − 41 |
| „ Holland | 25 | 73 | + 48 |
| „ Belgium | 6 | 21 | + 15 |
| *Telegraph and telephone wires and cables—* | | | |
| Total | 97 | 72 | − 25 |
| From United Kingdom | 83 | 57 | − 26 |
| „ Germany | 11 | 4 | − 7 |
| „ United States | 2 | 9 | + 7 |
| *Bare copper wire, electrolytic, other than telegraph and telephone wire—* | | | |
| Total | 2,087 | 2,099 | + 12 |
| From United Kingdom | 1,579 | 1,707 | + 128 |
| „ Germany | 129 | 170 | + 41 |
| „ Holland | 117 | 131 | + 14 |
| „ Japan | — | 19 | + 19 |
| *Telegraph and telephone instruments and apparatus—* | | | |
| Total | 477 | 587 | + 110 |
| From United Kingdom | 402 | 492 | + 90 |
| „ United States | 22 | 21 | − 1 |
| „ Sweden | 48 | 58 | + 10 |
| „ Germany | 1 | 12 | + 11 |
| *Electric glow lamps—* | | | |
| Total | 2,065 | 2,593 | + 528 |
| From United Kingdom | 788 | 676 | − 112 |
| „ Holland | 768 | 975 | + 207 |
| „ Germany | 135 | 214 | + 79 |
| „ Austria | 160 | 286 | + 126 |
| „ United States | 31 | 143 | + 112 |
| *Electric lamps, other sorts—* | | | |
| Total | 1,099 | 942 | − 157 |
| From United Kingdom | 62 | 114 | + 52 |
| „ Germany | 69 | 129 | + 60 |
| „ United States | 901 | 649 | − 252 |
| *Batteries—* | | | |
| Total | 1,017 | 1,100 | + 83 |
| From United Kingdom | 396 | 133 | − 263 |
| „ United States | 432 | 660 | + 228 |
| „ Germany | 185 | 248 | + 63 |
| *Electric carbons—* | | | |
| Total | 64 | 122 | + 58 |
| From United Kingdom | 40 | 100 | + 60 |
| *Accumulators—* | | | |
| Total | 1,670 | 2,220 | + 550 |
| From United Kingdom | 1,435 | 1,930 | + 495 |
| „ United States | 104 | 142 | + 38 |
| *Electric condensers (nearly all from U.K.)—* | | | |
| Total | 182 | 23 | − 159 |
| *Electric bell apparatus—* | | | |
| Total | 8 | 11 | + 3 |
| From United Kingdom | 1 | 2 | + 1 |
| „ Germany | 3 | 6 | + 3 |
| „ United States | 3 | 1 | − 2 |
| *Lighting accessories and fittings, including switches—* | | | |
| Total | 1,506 | 1,555 | + 49 |
| From United Kingdom | 1,092 | 1,087 | − 5 |
| „ Germany | 273 | 257 | − 16 |
| „ United States | 93 | 161 | + 68 |
| *Meters—* | | | |
| Total | 551 | 669 | + 118 |
| From United Kingdom | 459 | 510 | + 51 |
| „ Germany | 48 | 110 | + 62 |
| „ Switzerland | 9 | 13 | + 4 |
| „ United States | 33 | 33 | — |
| *Electro-medical apparatus—* | | | |
| Total | 176 | 186 | + 10 |
| From United Kingdom | 45 | 63 | + 18 |
| „ United States | 60 | 86 | + 26 |
| „ Germany | 11 | 27 | + 16 |
| „ France | 47 | 8 | − 39 |
| *Switchboards (other than telegraph and telephone)—* | | | |
| Total | 409 | 500 | + 91 |
| From United Kingdom | 395 | 488 | + 93 |
| „ United States | 11 | 3 | − 8 |
| „ Germany | 2 | 6 | + 4 |
| *Electrical goods and apparatus, unenumerated—* | | | |
| Total | 3,625 | 4,674 | +1,049 |
| From United Kingdom | 2,273 | 2,816 | + 543 |
| „ Germany | 551 | 610 | + 59 |
| „ United States | 584 | 965 | + 381 |
| „ Japan | 109 | 110 | + 1 |

# The Electrical Contractors' Association.

### Annual Conference at Bournemouth.

THE Electrical Contractors' Association has sent us the provisional programme of its fourth annual conference, which is to be held at Bournemouth from Wednesday, June 26th, to Friday, June 28th. This follows very closely the lines upon which the previous conferences, at Brighton, Scarborough and Cheltenham, have been so successfully carried out.

The first day will be devoted to a meeting of the Council of the three allied associations—the others being the National Federated Electrical Association and the N.E.C.T.A., Ltd.—and to the arrival and registration of delegates. In the evening the President (Mr. W. H. Walton) will hold a reception in the New Pavilion, after which there will be dancing in the ball room.

On Thursday, June 27th, the annual general meeting will take place at the Town Hall, and the conference will be officially opened at 11.30 a.m. The Mayor of Bournemouth will welcome the delegates, and Mr. Walton, after responding, will deliver his presidential address. At the close of the meeting the official photograph and luncheon will be taken. The afternoon session will be occupied by the reading and discussion of a paper by Mr. A. G. Bruty (Dublin) on "The Mutual Responsibility of Contractors, Manufacturers and Supply Undertakings (*a*) to the Electrical Industry, and (*b*) to the Public." In the evening there will be a smoking concert in the Pavilion.

On the following day (Friday) a paper by Mr. H. R. Taunton, on "Possibilities for Contractors in Rural Electrification," will be read and discussed. Then, after the usual votes of thanks, the new president will be installed, and will deliver a short address. For the afternoon a special trip to Southampton for a tour of the *Aquitania* has been arranged, and the proceedings will conclude with a ball and supper at the Pavilion, at the invitation of the Mayor of Bournemouth.

Arrangements are being made for the entertainment of those delegates who desire to stay in Bournemouth over the week-end, and as at previous conferences the welfare of the ladies during the business sessions is being provided for.

Forms for registration and hotel accommodation, and a special railway concession are included in the programme.

# The North-East Coast Exhibition.

### Electrical and Allied Exhibitors.

THE North-East Coast Exhibition at Newcastle-upon-Tyne, which opens on May 14th, is expected to act as a powerful stimulant to industry and trade in one of the most important areas of the country. The displays which have been arranged are fully representative of the various phases of civic and industrial life, and the exhibitors are over 300 in number; of these about 10 per cent. are connected with the electrical or allied industries. A list of these exhibitors is given below:—

**Palace of Industries:—**

Bakelite, Ltd.
Beatty Bros., Ltd.
Belling & Co.
Electrolux, Ltd.
E.L.M.A.
Falconar, Cross & Co., Ltd.
Falk, Stadelmann & Co., Ltd.
Hoover, Ltd.
Jackson Electric Stove Co., Ltd.
Newcastle-upon-Tyne E.S. Co., Ltd.
Revo Electric Co., Ltd.
Ruberoid Co., Ltd.

**Palace of Engineering:—**

Babcock & Wilcox, Ltd.
British Broadcasting Corporation.
British Electrical Repairs, Ltd.
Cambridge Instrument Co., Ltd.
Clarke, Chapman & Co., Ltd.
Filtrators, Ltd.
Holmes, J. H., & Co., Ltd.
Ideal Homes Electrical Appliances.
International Combustion Co., Ltd., & Underfeed Stoker Co., Ltd.
Newcastle-upon-Tyne E.S. Co., Ltd.
C. A. Parsons & Co., Ltd.
Petters, Ltd.
Reyrolle, A., & Co., Ltd.
Robson & Coleman.
Slingsby, H. C.
Yorks. Electric Detonator Co., Ltd.

# The Electrical Trades Benevolent Institution.

### Annual General Meeting.

THE annual general meeting of the Electrical Trades Benevolent Institution was held in London on April 29th. The Council's report and statement of accounts for the year 1928, which were adopted, disclosed the facts that the income from contributions for the year was £3,937, making, with the receipts from dividends and other sources, a total income of £5,468. The result of the year's work was that an amount of £2,395 was carried to the capital account after the payment of grants and expenses. During the year a further £4,804 was invested, bringing the total of the invested funds up to £37,318 at cost.

The annual festival held in November, 1928, was presided over by Mr. Lawrence G. Sloan, J.P., president of the Institution, whose appeal resulted in the collection of £3,243, which amount has only been exceeded once before in the history of the Institution.

Each succeeding year demonstrates more and more strongly the necessity of this Institution; during the year under review the number of grants made was over 400, amounting to £2,535, as against 221 grants during the preceding year, accounting for £2,048. Every qualified applicant received assistance.

The Council was, during the year under review, able to grant seven pensions, which have been operative since April, 1928, and the results have been so gratifying that it is hoped during the current year to be able to extend the benefits of this innovation and thereby enable more beneficiaries to enjoy the advantages of an assured income, thus permitting them to adjust their circumstances so as to get the greatest benefit from their incomes.

At the annual general meeting referred to above, Lt.-Col. K. Edgcumbe, president of the Institution of Electrical Engineers, took the chair. In opening the meeting, he commented on the pleasing manner in which the E.T.B.I. and the I.E.E. pulled together. In proposing the adoption of the report, Col. Edgcumbe congratulated the Institution on its year's working. He was impressed by the manner in which the Institution had made investments, and by the increasing income therefrom. He was surprised at the few associates possessed by the E.T.B.I., but that was probably due to that class of membership being comparatively new to the body. A subscription of 5s. a year would no doubt attract many associates in the near future.

Mr. E. A. Gatehouse (Electrical Review) seconded the adoption of the report, remarking that the year had been a gratifying one for the Institution; but they needed more and more money.

The hon. auditors and hon. solicitors of the Institution for the past year were re-elected for the coming year.

Votes of thanks were passed to the technical Press, to the I.E.E. for the loan of its building, and to the chairman. The name of Mr. Howard Marryat was mentioned in connection with the presidency for the coming year.

### Electrical Fires in the United States.

The annual report of the Bureau of Electricity of the New York Board of Fire Underwriters states that during 1928 inspections of the complete wiring of 4,970 buildings, in which were 18,489 separate equipments, were carried out. Of these, 10,368 were found to be unsatisfactory, and in many cases unsafe. Since the re-inspection service was commenced on its present scale approximately seven years ago some 26,233 buildings have been examined.

The Bureau had 1,220 fires of reported electrical origin called to its attention during 1928. It was found upon investigation that 1,015 of them could be attributed to electricity, and between them they caused an aggregate loss of $254,706. The following ten classes of fires produced the largest losses:—

| | No. of fires. | Losses. $ |
|---|---|---|
| Heaters: electric pressing irons ... ... ... | 216 | 70,058 |
| Flexible cord: used for circuit work ... ... | 93 | 47,261 |
| Wireless: receiving sets ... ... ... ... | 52 | 18,444 |
| Motors and generators: sparks ... ... ... | 24 | 13,682 |
| Conductors in gutter space ... ... ... ... | 33 | 11,835 |
| Short circuits: accidental ... ... ... ... | 38 | 9,031 |
| Volatile liquids: ignition of varnish remover | 21 | 8,996 |
| Motors and generators: disturbance in winding ... ... ... ... ... ... | 92 | 8,564 |
| Short circuits: electrically-operated toys ... | 9 | 8,276 |
| Cables, armoured: heating of armour of interior cables ... ... ... ... ... ... | 31 | 5,852 |

# Distribution Accessories.

**Improved flexibility of growing systems is achieved because it is recognised that the design of accessories is a specialist's job.**

By CAPT. P. DUNSHEATH, O.B.E., M.I.E.E.

*(Abstract of a paper read before the* LONDON LOCAL TECHNICAL GROUP *of the* ELECTRICAL POWER ENGINEERS' ASSOCIATION.)

THE security of a distribution system depends quite as much on the selection of suitable accessories as on the laying of suitable cable.

For simple and rapid assembly combined with reliability the cast-iron box is recognised to be the most effective accessory for jointing lengths of cable. In a split box which the author has in mind, an effective bond between the lead sheath and the box is made by a mechanical clamp, as shown in fig. 1, a cast-iron shuttle is forced down on the lead strip from a bridge across the compound filling hole, a "stop"

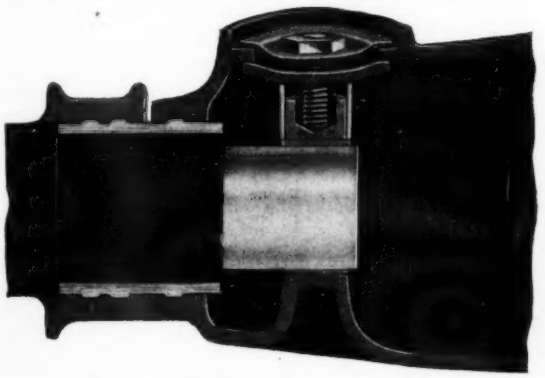


**Fig. 1.—Mechanical-clamp Bonding.**

being provided to prevent undue pressure being applied to the lead sheath. Wood bushes are always a possible source of failure in boxes buried in the ground. A very useful sleeve for the jointing of conductors is the "weak-back" ferrule. This is similar to the ordinary tinned-copper sleeve, except that it has a groove along its length diametrically opposite to the split. This design has the advantage that no undue bending of the paper-insulated cores is necessary.

An important feature in the design of service boxes is that as they are generally connected up while the cable is alive, sufficient room has to be allowed to accommodate the splayed-out joint. Regarding the advantages of the double-service box, apart from the desirability of having the minimum number of joints on the main cable, there is the important saving of time, labour and material. Economy of time in teeing off services and improved mechanical and electrical efficiency are obtained by the use of the claw connector shown in fig. 2. The fitting is made of soft tinned-copper, and the claws are easily bent round the main conductor. Figures obtained on a complete series of tests on several sizes of conductors showed a 20 per cent. advantage in favour of the claw over the earlier married type of connection. Where skilled plumber jointers are available, all-lead service boxes are a first-class proposition when made from lead sheet; a sound watertight and electri-

**Fig. 2.—Claw Connector.**

cally continuous joint is obtained. As ordinary lead castings are susceptible to disintegration and porosity, particularly if subjected to vibration, a sheet-lead pressing is preferable.

The designs of terminal boxes are influenced by many considerations, and ranges of boxes are available for indoor and outdoor working, wall, floor or pole mounting, and for varying sizes of incoming cables and outgoing cables, and, of course, for different voltages. All are provided with suitable armour clamps, when required, and with means of bonding the lead sheathing. Fig. 3 shows a l.p. box of the right-angle variety, required for floor fixing with the tails leaving vertically. The design is also arranged for erection on a ceiling or wall, or even on its side, and provision is made for filling

**Fig. 3.—L.P. Right-angle Terminal Box.**

in any position. Fig. 4 shows a useful outdoor box for l.p. working, having the outgoing conductors leaving the box from under a weather shed, through porcelain bushes. The box is filled with compound through the oval hole at the top, and this is protected by a domed cover held in position by clamping screws.

There are two well-known types of h.p. and e.h.p. outdoor terminal boxes with protection against driving rain and snow

**Fig. 4.—L.P. Outdoor Terminal Box.**

storms; one has the outgoing insulators separately surrounded by metal bells to shield the insulators from rain, snow and deposits of dust, the other has exposed insulators with large petticoats which rely on their long creepage, and on rain to wash away any dust or foreign matter which may collect.

Fig. 5 shows an example of the latter type. The only satisfactory way of jointing up boxes of this description is to bolt the box to the terminal pole first, and make the joint after, suitable staging being provided for the jointer.

The design of the lid of disconnecting boxes is of considerable importance, as any entry of moisture may result in flooding the box and causing breakdown. The machined lid with a wide flange has proved very successful in the past, provided it is placed in position with care and the machined surfaces are carefully cleaned on each occasion. The diving bell lid is a very sound proposition, both simple and certain. It

**Fig. 5.—E.H.P. Terminal Box; Large Petticoats.**

relies on the water being unable to rise inside the lip of the lid due to the back pressure of the air inside the box. The following may be regarded as some of the salient features of a good design of disconnecting box: elimination of joints, especially "dry" joints, under compound; high insulation properties; high conductivity of the current-carrying parts; simplicity in jointing and the provision of ample room for splaying the cores of the cables; water-tightness; efficient bonding and provision for dealing with the armouring of the cables; and substitution of interchangeable fuses for links. Fig. 6 shows a complete straight-through box. Such a box, it is claimed, will probably withstand safely a ten-foot head of water. There are occasions when it is convenient to do away with a brick pit and to substitute a disconnecting box with a combined cast-iron pit frame and cover. In view of the small space occupied by such a pit, this arrangement is very advantageous in localities where pathways are narrow. The saving in time of installation is also, of course, a strong point in its favour. Fig. 8 shows the pit and components separated. A feature is the ample space provided for splaying the cores of the cable.

Where greater accessibility is required than is furnished by a disconnecting box, the feeder pillar is employed. The "Henley" pillar is designed on the unit principle. The units consist of a cast-iron terminal box fitted to two solid-drawn steel tubes, insulated with micanite, on the front of which the fuse or link contacts and busbar connections are clamped. This arrangement entirely eliminates the use of v.i.r. tails from the terminal box to the fuse or link contacts, the cores of the cable being connected directly to the contacts by means of suitable fittings inside the terminal box. Units of varying capacities can be mounted side by side and connected together

**Fig. 6.—Straight-through Disconnecting Box.**

by common busbars, the busbar connections on all sizes of units being arranged on the same level. The adoption of micanite as the insulation in the pillar unit is the result of much careful research, and it has been proved that this form of insulation offers many advantages, both mechanical and electrical, over other methods. Humid atmospheric conditions are often the cause of much trouble in pillars, and the use of a ventilation unit consisting of a carbon-filament lamp with a small fuse connected across the busbars has proved very efficient. The following tests have been carried out. Units were placed in the River Thames off the jetty at Gravesend, one set lying in the river mud and one secured to the jetty, in such positions that they were alternately covered with water and exposed to the weather, according to the state of the tide. After seven days of this treatment, the units were washed down with water from a hose, superficially dried, without the aid of artificial heat, and subjected to a series of puncture tests. The first breakdown occurred on the neutral fitting at 22,000 V, the second on the positive fitting at 22,000 V, and the third on the negative fitting at 23,000 V. It is interesting to note that after the flood of last year several of the pillars, after being completely submerged, were switched on and operated successfully without any restoring treatment, apparently no worse for their experience. Fig. 7 shows an application of the pillar units in which they are housed in a drip-proof casing as a d.p. distribution board in a large paper works. Thirteen such assemblies were employed in the one system, and in order to economise floor space the units are arranged in two tiers.

## Discussion.

Mr. Harmer, commenting on a suggestion that the various accessories could be cheapened by lightening the metal, urged that simplicity and cheapness could best be effected by reducing the number of parts.

Referring to the trouble of condensation in the bell, he said it had been eliminated completely by applying cork dust to the inside of the bell, the method being to heat the bell, pour in a layer of compound, and dust the cork on.

Mr. A. G. Hilling said that the pressed-lead service box enclosed in a cast-iron cover would be an ideal arrangement if one could afford to disregard price. In his undertaking they used a lead sleeve in their service boxes; the jointer made it himself and did his own plumbing, and the cost was quite small. Some years ago his undertaking had used unit-type feeder pillars, but had found them most unsatisfactory because the compound oozed out at the back as soon as the cable became a little warm. They had tried to do away with the iron troughs, and used triple concentric tails, which were jointed at the works; these tails were re-painted about once a year with Voltalac varnish.

Mr. J. Morley said that from an examination of some of the elaborate net-work boxes, pillars, &c., which Capt. Dunsheath had illustrated, it had occurred to him that in many cases it would be practically impossible to put in another cable, or to take out a cable, while the boxes remained alive. It must be borne in mind by manufacturers that in future it would be more and more imperative that the supply should be continuous.

Mr. J. H. Wadman suggested that with the growing use of special disconnecting boxes, when fuses were fitted, it would be necessary to provide some form of testing socket, in view of the increasing loads. In the undertaking with which he was associated, a pavement test board was used, so that tests could be made before one began work on the boxes.

Mr. H. J. Henwood said that at East Ham Henley's boxes only were used for connecting services, and the whole of the jointers employed, with the exception of two, were semi-

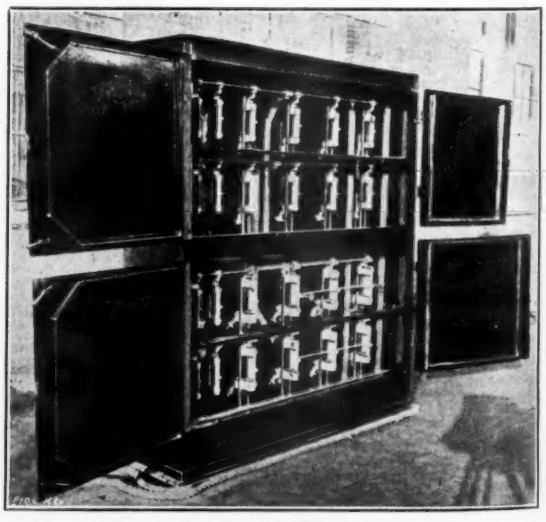


**Fig. 7.—D.P. Distribution Board of Pillar Units.**

skilled men. Some of them were the more intelligent of the labourers, and they had been trained by the undertaking's staff and had worked quite satisfactorily so far. He thought that sheet-metal feeder-pillar cases would be more dangerous than the cast-iron shells; if a lorry hit a pillar with a cast-iron shell, the shell would probably shatter and the pillar would continue to do its work, but a sheet-metal case would be bent badly, and the task of removing it would be a somewhat lengthy one.

Mr. E. A. Deacon complained of the small size of filling holes in some boxes. As the result of small holes, if a bituminous compound were used there was a tendency for it to solidify before it was distributed all over the box.

Mr. WILLIAM F. ANDREWS said that if made-up lead sleeves were used the plumber-jointer would have nothing to do while waiting for his mate to come out of the hole; he might just as well be engaged in beating up the lead sheet as doing nothing.

Mr. PRATT thought that where a lead sleeve was used there was no need to enclose it in a cast-iron box. The practice of enclosing the sleeve in a concrete box was probably the best. Subsequently the expensive cast-iron boxes were discarded, however, and lead sleeves employed, and so far as he knew there had not been a single failure with the lead sleeves. Breeches joints were adopted; the T joint occupied much more space, cost more money, and distinctly more time was required to make it.

Captain DUNSHEATH agreed that it was desirable to cheapen the various accessories by reducing the number of parts as far as possible, but that was not an alternative to improving the design; the two should go together. The application of cork dust to the inside of the bell was an excellent method of overcoming the accumulation of condensation. He was doubtful whether those other than manufacturers who made accessories for their own use knew what their costs were. He said that by organisation it should be possible to obviate the necessity for the jointer to wait until the navvy had dug the hole. If tails had to be painted once a year, the large undertakings of the future would have to employ armies of painters; it was better to aim at a sound engineering job which required very little maintenance. Discussing the reference to sheet-metal and cast-iron pillar covers, he said that the sheet-steel cover would provide the greater resistance to damage, and there was less likelihood of the lorry damaging the pillar at all. He agreed that a small filling hole in a box was useless; the point had been appreciated, and in most fittings large filling holes had been provided. The problem of installing test shelves in pillars depended, of course, upon space.

**Fig. 8.—Combined Disconnecting Box and Pit.**

His undertaking was very proud of its design of feeder pillar, but it had one bad feature, the ventilation hole at the top admitted dust. He also suggested that manufacturers might consider the inclusion in pillars of test shelves which would not vibrate when traffic passed.

The CHAIRMAN (Mr. A. H. Bennett) said that his undertaking was spending as much as £20 or £30 per week on occasions, owing to breakdowns due to the use of the cast-iron boxes.

# The National Physical Laboratory.

## Abstract of the Annual Report of the Executive Committee for the Year 1928.

IN the annual report* on the work of the National Physical Laboratory during 1928 there is satisfactory evidence that the assistance the Laboratory can give to industry, by assuring high standards of quality and by solving manufacturing difficulties, has been more fully realised by the producers and users of British goods In the further increase in the paid work of the Laboratory its general usefulness has been raised and a closer co-operation with industry secured. The total number of tests carried out during the year under review, excluding clinical thermometers (519,797), was 50,493, as compared with 43,130 for the previous year. The electricity department made 4,069 tests, an increase of 1,509 on the figure for 1927. The great increase in the electrical tests is largely accounted for by the tests carried out on reflectors in the photometry section, the figure being 1,026, as against 8 for the previous year. Time which it was hoped would be available for general research has been given to test work and maintenance of standards, and although the cost of test work and special investigations for firms and outside bodies is defrayed by the interests concerned, additional staff with the necessary expert experience cannot at once be obtained. However, the work accomplished under the Laboratory programme, as well as under the programmes controlled by departmental boards and committees, has furnished results of high interest which are likely to be of great value in their industrial applications.

The scheme for the new physics building provides for the erection of the central block of the building, with accommodation sufficient for all the work of the physics department at present carried on in Bushy House, and the final plans for this central block have now been agreed upon, and the contract placed; its construction was begun in the new year. While not removing the difficulty of administering a department housed in a number of scattered buildings, this first instalment of the proposed physics building will enable the work of the heat division to be carried on under much improved conditions. Some of the space vacated in Bushy House will provide much needed accommodation for the electrical standards division.

The Air Ministry has received sanction for the construction of a compressed-air tunnel at the National Physical Laboratory, and the work has been commenced.

The erection of the million-volt transformers in the high-tension building was completed in June last, and preliminary runs were made on the occasion of the visit of the General Board on June 26th. At a later date the installation successfully passed the contract tests, which included a run of one hour at 10 per cent. overload. The completion of the remainder of the equipment proceeded during the autumn.

In the early part of 1928 an offer was conveyed to the Commonwealth of Australia Research Council by the Lord President of the Privy Council, on behalf of H.M. Government, to carry out without charge at the National Physical Laboratory the verification, over a period of five years, of the standards to be procured by the Commonwealth Research Council for use in Australia. Full information as to the standards likely to be required was sent to Australia in a report from the Laboratory. Assistance has also been given to Canada, India, and South Africa in connection with standards for specific purposes. Representatives of the Laboratory have taken part, during the year, in a number of important meetings and conferences directed to establishing or maintaining international uniformity and agreement in the standards of measurement employed for various purposes.

Dr. Kaye, superintendent of the physics department, attended the International Congress of Radiology, Stockholm, July 23rd to 27th, as the representative of the Laboratory; he also acted as one of the representatives of the British Institute of Radiology. Of the physical questions discussed two were of particular interest to the Laboratory, *viz.*, X-ray protection, and the adoption of an X-ray unit of intensity. The British X-ray and Radium Protection Committee submitted for international adoption proposals designed to unify protective measures in the different countries; these were unanimously agreed to, and the use of the measures which have been approved and recommended by the British Committee and the Laboratory has thus received international

* H.M. Stationery Office, price 9s. net.

authority. Agreement was also reached on the question of establishing an international unit to serve as a basis for measurement of X-ray dosage.

A meeting of the Union Radio Scientifique Internationale was held at Brussels in September, and Dr. Dye attended on behalf of the British National Committee and of the Laboratory. Arrangements were made for international intercomparison of frequency measurements by means of series of special signals, and also by the circulation, as a frequency standard, of a self-contained piezo-electric quartz oscillator with temperature control. Simultaneous measurements are to be made by a number of national laboratories of the wavelength of signals transmitted from the naval experimental short-wave station at Arlington. In addition, comparative measurements, by various methods, of high-frequency current are proposed.

At the fifth International Congress of Refrigeration, held at Rome from April 9th to 15th, five papers by members of the Laboratory staff were presented.

Five papers were presented by members of the Laboratory staff at the plenary meeting of the International Commission on Illumination, held from September 22nd to 29th at Saranac Inn, New York. Dr. Walsh attended as general secretary, and was appointed hon. secretary for the succeeding three years. Mr. W. S. Stiles, a member of the staff of the photometry division of the Laboratory, will succeed him as general secretary of the Commission. On the subjects of daylight, coloured glasses for signals, and colorimetry, the British National Committee acted as international secretariat, and presented reports in each case, indicating the present state of the subject and the researches required for future progress. (ELECTRICAL REVIEW, September 21st, 1928, p. 473, and following issues).

In July, at a meeting of the Electrical Units and Standards Committee of the Laboratory, a memorandum was drawn up expressing the views of the Committee on a number of important questions regarding the electrical units, and the organisation and procedure desirable for securing international co-operation and agreement in the units and standards employed. This memorandum was presented to the Consultative Committee by Dr. Dye at its meeting in November, together with detailed technical information regarding the methods employed at Teddington, and intercomparison of standards effected with other national laboratories. It was agreed that the absolute C.G.S. units might with advantage be substituted for the international units for all scientific and industrial measurements, and that their adoption be recommended to the Comité International des Poids et Mesures. It was also agreed that further researches were necessary to fix the ratio of the international units to the absolute units with sufficient precision. These resolutions were in the main in agreement with the views expressed by the Electrical Units and Standards Committee. The International Committee also recommended that the following functions be assigned to the Bureau International des Poids et Mesures in connection with the electrical units: (1) to serve as a central secretariat for the organisation of a systematic exchange of standards, and to undertake the synthesis of the results of the comparisons made by the national laboratories; (2) to provide a laboratory to which the material standards representing the results obtained in the different countries can be sent for precise comparison; and (3) to be a depository of reference and working standards, including standards of inductance and capacity, with the necessary equipment for the comparison of other stands with those of the Bureau.

Under the auspices of the International Electrotechnical Commission, a meeting was held in Paris, in November, with a view to securing international agreement on a figure for the resistivity of high-grade commercial aluminium as now largely used in electrical conductors. The Laboratory has carried out much work on the resistivity of aluminium, and at the request of the British Committee Dr. Rayner attended in Paris to give assistance. The value 0.02873 ohm at 20 deg. C. was agreed for the resistance of a wire of hard-drawn aluminium of 99.5 per cent. purity, one metre in length and of a uniform section of 1 mm$^2$.

The Research Committee, under the chairmanship of Sir J. J. Thomson, continues to advise generally on the research programme of the Laboratory, and as to new researches proposed or which it is thought desirable the Laboratory should take up. It holds periodical meetings at the Laboratory, and inspects the work in progress. The Executive Committee has also the advice and assistance of a number of special committees in the control of the scientific work undertaken by the Laboratory under the headings of "General Research" and "Maintenance of Standards." An Advisory Committee for Metallurgical and Engineering Research on Materials was appointed in March, with Sir John Dewrance as chairman. At its first meeting in May they reviewed the programmes of research on materials in the metallurgy and engineering departments, and recommended a scheme of future research, which was adopted by the Executive Committee and is now being followed in the development of the work. In particular, they urged the importance of a redetermination, in the light of the greatly improved methods of present-day technique, of the iron-carbon equilibrium diagram, of which the first complete determination was made at the Laboratory by Carpenter and Keeling some twenty-four years ago. They suggested also the inclusion in the "general research" programme of the engineering department of an investigation into the stress-strain relations obtaining during rupture in an impact test, with the object of elucidating the many aspects of failure by impact that are at present obscure. Another investigation which the committee regarded as of special importance was the research into the behaviour of steels during solidification, with special reference to the liberation of gases.

A High-Tension Committee was appointed in October, 1926, to advise the Executive Committee regarding the programme of research to be carried out with the million-volt installation then under construction. A provisional programme of research recommended by that committee has been approved, and work has been in progress, so far as circumstances have permitted, during the past two years. The work so far done has mainly consisted in the provision of special apparatus, and the study of methods of measurement that will be needed in the future researches.

A number of special visits have been arranged during the past year of bodies interested in the work of the Laboratory. In May some 80 electrical engineers attending an illumination design course organised by the Electric Lamp Manufacturers' Association of Great Britain were received. In June the Laboratory entertained 100 of the engineers attending the Centenary meetings of the Institution of Civil Engineers. In September, visitors to the Fuel Conference organised by the World Power Conference were received at the Laboratory, and in November some 150 members attending the meetings of the British Institute of Radiology were conducted over the physics departments by their president, Dr. Kaye, and other members of the Laboratory staff.

Good progress has been made in the physics department with a large number of important researches which have been continued over an extended period. The thermal and electrical conductivities of series of alloys of copper and aluminium, respectively, with a number of other metals, have been determined at temperatures from 50 deg. C. to 250 deg. C. The results are in general agreement with the law of Lorentz, according to which the product of the thermal conductivity and the electrical resistivity divided by the absolute temperature is a constant. Work has been begun with a view to measurements at higher temperatures, up to 900 deg. C.; the method will be comparative, pure iron being used as a standard. Interesting results have also been obtained in measurements of the thermal conductivity of solid and liquid sulphur, marked variations occurring at the melting point and at the physical-change points. Work has been commenced on the effect of a strong magnetic field on the thermal conductivity of a single crystal of bismuth. The results of the investigation into heat flow through insulating walls, as affected by certain modifications of shape, have been published. As usual, a number of determinations of the conductivity of heat-insulating materials have been made for firms. Preliminary experiments have been carried out during the year, with a view to the determination of the specific heats of gases at high temperatures and pressures. The Research Committee has recommended the continuation of these experiments during the coming year. Work on the heats of combustion of gases and the measurement of flame temperatures has been continued.

A very extensive programme of work has been carried out in relation to the international temperature scale, provisionally approved at the seventh "Conférence Générale des Poids et Mesures" in 1927. In this connection various improvements have been made in the high-frequency induction furnace constructed in 1927. Experiments have also been in progress with a view to providing suitable means of measuring the temperature of end bar wave-length standards to an accuracy of a few thousandths of a deg. C.

The radiology division has given important assistance to the engineering department in the investigation of the mechanism of the distortion of metallic crystals. The distortion of the three types of lattice when single crystal test-pieces of aluminium, iron and zinc were submitted to strain has been examined by X-ray spectrophotometric methods, and a number of interesting points were investigated in the course of the work. An interesting research has been completed on the relation between X-ray absorption and wave-length. On the basis of wave mechanics the absorption coefficient can be expressed in the form $a\lambda^n + b$, where $a$, $b$, $n$ are constants for any element for values of $\lambda$ between an adjacent pair of the K, I, N, &c., absorption edges; this form is found to be in excellent agreement with experiment. The absolute absorption in gold of homogeneous X-radiation was measured for some thirty wave-lengths between 0.6 and 2.0 Angstrom units, and corresponding measurements were made also for copper and platinum. In connection with the definition of X-ray intensity and dosage approved at the International Radiology Congress at Stockholm, a new ionisation chamber has been set up for standard measurements, and provisional determinations have been made of the pastille dose in "Röntgen" units. Experiments have also been made with a valve method of measuring ionisation currents. A constant high-voltage generator for X-ray work has been designed and constructed. Work for the departmental committee on the industrial applications of X-ray methods of crystal analysis has related to tungsten magnet steels, the effect of rolling on aluminium, materials for the manufacture of paints and varnishes, transformer steels and electrical insulating materials.

*(To be concluded.)*

# Good Radio Reproduction.

**The anode-feed resistance system is claimed to be an important means of minimising the feed-back tendency of receivers, which causes distortion.**

BRIEFLY, the system to be described consists in feeding the plate of each valve of a receiver through a resistance in order to drop the voltage to the required value, and of connecting the usual 2-mfd. by-pass condenser from the point at which the h.t. is fed to each component of the receiver to h.t. negative.

The circuit of the classical 3-valve receiver to which the anode-feed resistance system has been applied is shown in fig. 1: normally the h.t. from the battery would be taken direct to the points h.t.+1, h.t.+2 and l.s.+, from each of which points a 2-mfd. condenser is connected to h.t. negative. As the total h.t. available is generally required on the output valve v3, no resistance is connected in series with it, although

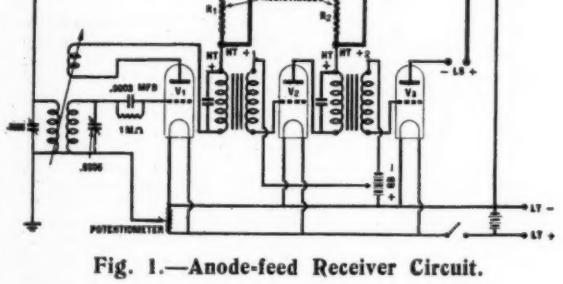



**Fig. 1.—Anode-feed Receiver Circuit.**

in certain cases it may be desirable if the voltage is higher than the output valve will stand. The voltage for each of the valves v1 and v2 is dropped by means of the resistances R1 and R2 to a suitable value, and in the general case when 120 volts is available R1 will require to be about 20,000 ohms and R2 about 15,000 ohms.

The calculation of the values of the resistances required is quite simple, provided that the characteristics of the valves employed are known. The anode-feed resistance required in any particular instance depends on the total h.t. available, the voltage required for the valve, and the plate current which the valve takes under working conditions. These figures can readily be obtained from the valve-makers' curves, and the resistance required is calculated from the voltage to be dropped divided by the plate current (expressed as a fraction of an ampere).

The object of incorporating the system in receivers will be understood from the following explanation: all sources of energy have appreciable internal resistance; the alternating impulses produced by the signal flow from the plate of each of the valves through the coupling components, and so to the h.t. negative, and in the absence of by-pass condensers the flow must occur through the source of h.t. supply. The output valve produces a very large pulsating current which, in flowing through the resistance of the h.t. supply, sets up an alternating voltage, the amount of the latter depending on the resistance of the h.t. supply and the strength of the signal delivered by the output valve, or valves, and it will be obvious that, as all the valves are connected to the one source of h.t., the alternating voltage must tend to feed back to the other stages and produce distortion. It will also be realised that if a receiver is provided with only one h.t. tapping, so that every valve has some voltage applied to it and is connected across the whole of the resistance of the battery, the maximum amount of back coupling results.

The first step towards overcoming this trouble is to provide an alternative path for the impulses, by using a separate h.t. tapping for each valve, or stage, and connecting a 2-mfd. condenser from the tapping (as near as possible to the component to which the h.t. is applied as can be) to the h.t. negative. The condensers offer an alternative path for the impulses to h.t. negative and reduce the tendency to back coupling to a large extent. The resistance, or impedance, of a condenser, however, varies with the frequency of the signal that it has to by-pass; for example, a 2-mfd. condenser has an impedance of about 900 ohms at 100 cycles and 1,800 ohms at 50 cycles, so that at those frequencies the condenser becomes relatively ineffective from a by-passing point of view, and to make it effective would mean an increase of capacity beyond that economically possible. The anode-feed resistance scheme, however, at a comparatively small cost, is claimed to overcome almost entirely the whole tendency of a receiver to back couple, and fig. 1 shows how the resistances are connected for the purpose. By connecting resistances in the manner indicated the resistance of the return path through the battery for each stage is made very high, usually not less than 20,000 ohms, so that the signal is literally forced to flow through the 2-mfd. by-pass condenser to h.t. negative, thus avoiding the source of h.t. supply. The same process is carried out with each stage, except the last, which is completely isolated from the other stages.

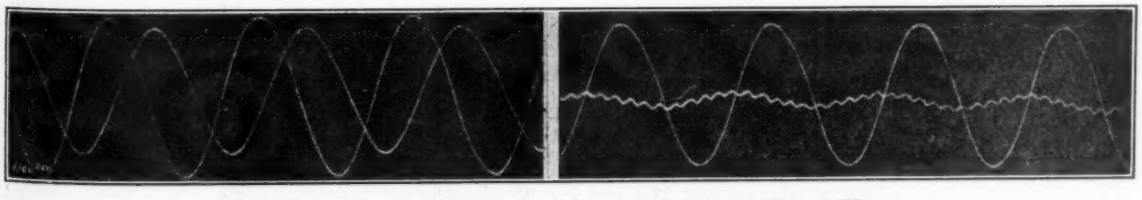
It is not essential to use resistances; in fact, a well designed audio-frequency choke having an inductance of the order of 50 henries under working conditions will be equally, if not more, satisfactory, but will not drop the voltage as is generally required, and will be considerably more expensive. However, the effectiveness of the system in preventing back coupling depends on the value of the various resistances being kept high with respect to the by-pass condensers, and, consequently, if the available voltage is low, say, of the order of 100, or less, it may not be permissible to drop much of the voltage in a resistance, and in such cases chokes should be used.

In the case of fig. 1 the input and output waves are identical: fig. 2 represents a receiver operating under ideal conditions, that is, with a separate anode battery for each valve; fig. 3 shows the same input wave applied to a receiver of which the anode battery has a high internal resistance, the wavy line representing the reduced output and the ripples indicating the high-pitched whistle caused by back coupling.

It should be clearly understood that this system is applicable to any receiver. As a rule the better the receiver the more desirable it is, since the tendency to back coupling is greatly increased with increase in amplification of the bass frequencies.

When applying the system to a screened-grid valve, or an anode-bend detector, two resistances should be connected in series and used in the form of a potentiometer. The screen of a screened-grid valve usually consumes about ¼ milliampere, and if a series resistance is used for dropping the voltage to the figure required (usually about 80) its value tends to be inconveniently large, although a series resistance can be used if desired. An anode-bend detector, however, when using transformer coupling, for example, will usually have a normal impedance of not more than 15,000 ohms, and the h.t. and grid bias will have to be adjusted to the order of ¼ milliampere before any signal is received. If, now, 200 volts are available and we require to drop 100 volts, the value of the series resistance will have to be 400,000 ohms, which, apart from being somewhat costly, will prevent the detector functioning as it should, because any tendency of the h.t. current to increase with the signal will tend to be counteracted by the increased drop in voltage in the resistance. When the potentiometer anode-feed method is used in this case the total value of the resistance need not be more than 100,000 ohms, and rather less than half is actually in series with the valve. Further, by connecting the necessary 2-mfd. by-pass condenser from the point at which the h.t. is tapped off the valve, the voltage at that point can be made to remain steady by the reservoir action of the condenser.

The method of calculating the requisite resistances in the case of the potentiometer system is the following: assume



**Figs. 2 and 3.—Oscillograms of Input and Output Signal Waves.**

that 200 volts are available, that 80 volts are required for the screen, and that we are going to use two fixed resistances in series across the source of h.t. supply. We can conveniently make the resistance which is connected at one end to the h.t. negative 50,000 ohms, and as the latter under working conditions has to have 80 volts across it, it will carry 1.6 milliamperes. The screen of the screened-grid valve usually takes about ½ milliampere, and therefore the resistance connected at the positive end has to carry 1.6 plus 0.5, namely 2.1 milliamperes. The resistance has therefore to drop the voltage from 200 to 80; that is, a drop of 120 volts when carrying 2.1 milliamperes. This value is therefore 120 divided by 0.0021 = 57,000 ohms, and the resistances required will be, say, 60,000 and 50,000 ohms, respectively.

In the case of powerful amplifiers it is desirable to apply this system also to the grid-bias supply, and, in conclusion, it may be mentioned that the anode-feed resistance scheme, for the development of which Messrs. Ferranti, Ltd., have been largely responsible, has the incidental advantages of enabling a set to be constructed, if desired, with only two external h.t. terminals, and of preventing also the accidental destruction of the valves by an internal short circuit, a fault which can be particularly destructive in the case of screened-grid valves. Attempts are sometimes made to protect valves from destruction by connecting a fuse in the negative lead, but as the fuse must have appreciable resistance, it merely adds to the battery resistance and tends to increase back coupling, to the removal of which all efforts should be directed.

# London's Electricity Supply.

## Comments on some of the many problems which are being encountered and will have to be solved in the near future.

*(Extracts from a lecture delivered before the* LONDON TECHNICAL GROUP *of the* ELECTRICAL POWER ENGINEERS' ASSOCIATION.)

ELECTRICITY supply in London and the Home Counties was the subject of a lecture recently delivered before the London Local Technical Group of the Electrical Power Engineers' Association by Mr. F. W. Purse, who has served on many committees concerned with this matter, and has closely studied both its legal and technical aspects during recent years. His survey of the legislation affecting the industry, particularly in London, which had been passed since 1882, was prompted, not only on account of its historical interest, but also because he had found that many of those concerned had not a real appreciation of the obligations and duties which Parliament had thought fit to impose upon the industry from time to time. It served to emphasise the hindrances which had been due to Parliament rather than to the industry itself, although the industry was being criticised for the lack of progress which had resulted from the restrictions. He advised all to accept the 1926 Act in the best spirit and to do their best in the applcation of its provisions; the Central Electricity Board was functioning in an enthusiastic and conciliatory manner.

With regard to conditions in the industry generally, he suggested that in rural and sparsely-populated areas, at any rate, the house-to-house transformer system was likely to be adopted, or perhaps one transformer for every three houses, or something of that order. In some other places there would be at least one transformer in each street, and he urged the necessity for securing transformer and sub-station sites now and holding them until required, in view of the increasing difficulties of obtaining such sites. The 1926 Act had not interfered in respect of each local authority and company being allowed to retain its rights of distribution, but how long that state of affairs would obtain he would not like to say. He ventured to think the indications were that in, perhaps, 10 or 15 years' time there might be a move to combine in respect of distribution; possibly by that time there might be some standardisation of voltages.

Under the new scheme of generation controlled by the Central Board, it was idle for engineers to say that they could carry on just as well with their small stations; anyone who said that he could was denying his own faith. Quite a number of the smaller stations would in a few years drop out of existence so far as generation was concerned. Apart from the economy in coal and in generation costs generally, great economy would be effected, or it was supposed that it would be effected, by the reduction of the percentage of spare plant. He believed that at present between 50 and 60 per cent. of the plant was in the nature of spare plant, and it was hoped that that proportion would be reduced to 20 or 25 per cent. That would raise a very interesting problem. And when 20, 30 or 40 stations were running together in parallel it might be that, in order to get over "teething" troubles, at times of full load a group of half-a-dozen stations might have to be split off from the rest of the group, and a connection thrown in if there were unexpected trouble in any group; later on the number of stations would be reduced.

Generation would become highly specialised; it was becoming so already, and with the reduction of the number of stations one-time chief engineers and managers, as such, would lose their interest in it. Their successors might not have any interest, or any training, on the generation side, and distribution and sales men would come into their own. The problem of generation at high voltages was an important matter to be considered, and in connection with it also the problem of getting the load out of the stations. They might be limited unless they were given facilities for bringing the energy out of the stations on overhead lines at high voltages, which was a difficult matter in the London area.

The fact that the underground system for the "grid" in London was to operate at 66,000 volts would give rise to some very interesting problems. Every station connected to the "grid" would have to have very special protective gear; might have to have very elaborate reactances and controls, and might have to renew the whole of its switching. He gathered that meter makers had evolved some most interesting apparatus and instruments; there would have to be a new class of assistant (a meter-reading assistant) to take readings as they changed from hour to hour on each particular panel. Quite a big installation would be required in some stations for dealing with meter problems, he believed.

No doubt the time must arrive when electricity supply engineers would become "juice merchants," and the sooner they realised it and faced the new position the better for their peace of mind. They would then have to concentrate upon salesmanship and distribution. Uniformity of tariffs was very desirable, but the biggest of all problems was that of distribution. What was the use of struggling to reduce the cost of generation when one knew that that reduction could not be reflected in the price charged to consumers? Cost of services and standing charges to consumers must also be dealt with. The provision of more pre-payment meters was necessary, because electricity was being supplied to the grade of consumer who lived from hand to mouth, and could never save enough money to pay his accounts quarterly. Experience had shown that in certain classes of property more electricity was consumed if the consumers were provided with penny-in-the-slot meters than if they were provided with shilling-in-the-slot meters, because frequently they had not a shilling to put in.

Until recently he would have said there was no practical alternative for those undertakings at present distributing d.c. to changing over to a.c., but his views were changing as the result of the great improvements being effected in converting plant. Particularly, static rectifiers were very reliable; they did not require constant attention, could be shut up in their sub-stations like ordinary transformers, could be switched in by remote control, or time control, or automatically, according to the load. He ventured to think that in view of the high efficiency now obtainable at comparatively low cost many undertakers who were distributing d.c. would think twice before embarking upon a change over to a.c., particularly when they appreciated what the costs of changing over would be. It was difficult to see how electricity could be supplied more cheaply under such circumstances.

The acid test of the whole matter was whether the consumer was going to benefit. Benefit would be derived by proper regulation of the load between stations, and by a very carefully thought out rearrangement of the whole of their distribution. If the position were not pushed too far from a too highly academic point of view, there must be a substantial reduction in the cost of production which could be reflected in the charge to the consumers. It was possible, however, to push it too far. They need not look to the future in any spirit of pessimism. The future might not be entirely to their own liking, but they must take the line which presented the best opportunity.

### Discussion.

The CHAIRMAN (Mr. J. R. Cowie) said that in view of the scarcity of sites suitable for large buildings on the river in London it was not impossible to conceive that some day seaboard stations, and stations on the banks of the large inland waterways, might be the main stations for feeding London.

Mr. GILBERT said the main object of the scheme by which generation was to be centralised in super-stations was to supply electricity at a cheaper rate, but whether the rate to the consumer would be lower as the result seemed to be very questionable. He gathered that each super-station was to take a base

load, but he could hardly appreciate how a super-station of the size contemplated was going to have a base load the same at midnight as at mid-day, unless there was a very considerable number of other stations available to help in the distribution. With regard to the suggestion that within 10 or 15 years distribution might be taken over by some governing body, and that an endeavour would then be made to standardise distribution to one type and voltage, surely, if that were contemplated, the sooner it was done the better. If we were to wait 10 or 15 years and the demand increased as anticipated, it would be more difficult to convert the systems existing then than now. Finally, he urged the need for removing the existing restrictions and hindrances to the acquisition of sub-station sites.

Mr. WALLIS asked whether the London and Home Counties Joint Electricity Authority would take over the company undertakings in 1971 without further payment. If the sinking funds which had been arranged for were to pay for all the stations, and if those stations were supposed to be valueless in 1971, the companies might not spend further money on their undertakings during the last 20 years, or so, prior to 1971, but would simply allow them to become obsolete. How was that to be avoided?

Mr. WALTER J. JEFFERY pointed out that one of the disadvantages suffered by the London undertakings was that London was composed of three main types of area: the manufacturing, residential, and amusement areas, and each individual undertaking supplied practically an area of one of those types. There was no doubt that because those three types of area had never been worked together the price of electricity in certain areas had been much higher than it should have been. The standardising of distribution in London was at least as important as the standardising of generation. The maintenance of many different voltages and types of supply would be very disadvantageous as demand increased, and if one could buy from any store standard electrical apparatus which could be used on any supply system in London it would be all to the good and would certainly tend towards the cheapening of apparatus. In some parts of London two companies were supplying in the same area, and in one case three companies were supplying in the same street. In view of the crowding of London streets that was an anachronism, and should not be tolerated. The companies were tied down completely by recent Acts of Parliament, and there was no doubt that ,by reason of the sinking funds which had been instituted, the assets of the companies would be handed over to the Joint Authority in 1971 without any charge being incurred by that body.

Mr. J. H. C. BROOKING emphasised the importance of an adequate study of distribution problems, and of the provision of more opportunities for their discussion.

Mr. BRETELLE pointed out in connection with the development of large stations that although, if costs could be reduced by very small percentage, one could not hand on that reduction immediately to the individual domestic consumer, one could effect a reduction in charges to large power consumers. The effect of that would be cumulative; one would be able to generate on a far better scale as the result of big supplies, and by developing the power load one would be able to reduce the cost to domestic consumers as well. It must be borne in mind that power consumers made a big contribution towards meeting standing charges.

Mr. W. J. OSWALD, referring to the development of the domestic load, indicated some of the problems met with by reference to his experience during the severe weather experienced in February of this year. In one particular week the output was 128 per cent. above that of the corresponding week of the previous year, and the top load was 84 per cent. above that of the corresponding week of the previous year. Abnormal weather could be responsible for very great differences in demand, and one-shift and two-shift stations would be called upon to meet unexpected demands.

Mr. HENWOOD, commenting on Mr. Purse's reference to the wonderful meters which were to be supplied by manufacturers, pointed out the great importance of accuracy, and said that an error of 1 per cent. on a set metering considerable quantities of power would nullify the extra efficiency obtained by the engineers in the power stations.

Mr. D. KINGSBURY said it seemed to him that a number of undertakings laid out many years ago with a view to supplying electricity purely for lighting purposes would have to spend at lot of money in order to provide sufficient copper to enable them to supply at a decent voltage. That was linked up with the problem of sub-station sites, and he could not help thinking that they would have to contemplate the use of underground sub-stations at comparatively frequent intervals.

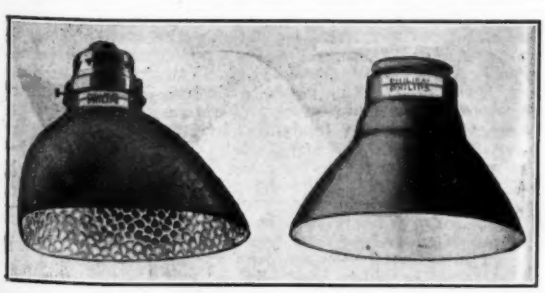
Mr. F. W. PURSE, replying to the discussion, said that when one realised that some of the large undertakings in the country was erecting large "windmills" and concrete cooling towers, one appreciated that seaboard sites were perhaps not all they were claimed to be. Sub-station sites could be purchased compulsorily, but the purchasers had to obtain a Special Order from the Commissioners and had to publish notices, and so on, and by the time the sites had been purchased one wished they had not done so. There were restrictions, of course, with regard to underground sub-stations; for instance, the maximum power supplied to any underground sub-station, or street box, must not, without the consent of the Commissioners, exceed 30 kW in the case of a sub-station or street box containing a single transformer, or 75 kW in the case of one containing two or more transformers. Again, sub-stations constructed below the surface of any street to which an extra-high-pressure was to be given must not contain switches or other apparatus than transformers. With regard to the purchase of the company undertakings in London, he said every company had to set aside a sinking fund according to a scale of depreciation, so that the assets would be liquidated within the time decided upon. In 1971 it would probably be found that new plant, machinery, &c., which had been installed during the last few years prior to that date had not been fully liquidated, and the balance would have to be paid. The company undertakings would be transferred to the Joint Authority practically debt-free. One of his criticisms of the 1926 Act had been that it had not provided for the standardisation of distribution, and that problem should have been tackled as fearlessly as that of standardisation of frequency had been.

# New Electrical Devices, Fittings, and Plant.

**Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.**

## Shop-window Reflectors.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2, have placed on the market a range of shop-window reflectors. Three patterns are made, namely, intensive



**Figs. 1 and 2.—Intensive and Spotlight "Philiray" Reflectors.**

(Type SA), extensive (Type SB), and spotlight (Type SC). The former is made in four sizes, suitable for lamps of 40-200 watts, whilst the SB and SC types are each made in two sizes, suitable for 100/200-watt lamps. These "Philiray" reflectors are made from crystal glass, highly polished on the inside, having numerous facets; each reflector receives two heavy coats of silver, protected by numerous applications of copper, electrically deposited by a new process, the exterior finish being made with two coats of aluminium. A close study of the reflector reveals that each facet reflects innumerable minute mirrors, thus ensuring the maximum possible reflection of light. A metal gallery is included, but for spotlights a special patent adjustable gallery can be supplied at extra cost. There is also available a swivelling gallery which enables the beam of light to be directed where desired. When used in conjunction with colour screens, very attractive lighting effects can be obtained.

The makers supply the colour screens and the necessary light filters. The screens consist of light-metal frames in which the colour filters (supplied in packets containing five assorted colours) rest. Figs. 1 and 2 show, respectively, types SA and SC reflectors.

## New Flood-Lighting Units.

In a new series of "Holophane" flood-lighting units, fig. 3, Messrs. HOLOPHANE, LTD., Elverton Street, Vincent Square, S.W.1, have incorporated a novel feature in the employment of prismatic front lenses to further control the projected beam of light. These prismatic lenses, besides giving definite control and direction to the beams, enable the light rays to be split up and diffused in such a manner as to

avoid the striation effect due to the image of the lamp filament.

The standard "Holophane" projectors are now made in three types—extensive for close-up projection, concentrating for more distant projection, and the rectangular-beam type for giving a beam with a rectangular spread. The three series of units employ different prismatic front lenses to obtain the requisite type of light distribution. In the extensive type of unit the front lens employs a series of concentric prism lenses which give spread to the beam; ordinary standard gas-filled lamps are used. The concentrating type has a front lens prism formation to give more concentration to the beam, as well as to break up the light rays, and the rectangular-beam type employs a lens with a vertical prism design which spreads the light in a direction at right angles to the line of the prisms. These three lenses are made of a heat-resistant glass which will stand the heat generated by such projectors. The projector housings are simple in design and made of heavy-gauge spun copper. The lampholder is fitted with a sliding tube lamp focusing device, to which is also fitted a screwed gland and horned cable outlet to protect the wiring from water. Side castings are fitted to the housing with a stirrup and swivel base, giving adjustment to the beam to any angle in both the horizontal and vertical planes. The extensive-type projector gives a strong, well diffused beam of light, having a divergence of approximately 40 deg.

The concentrating type gives a beam of 120 times the bare lamp candle power, with a divergence of 10 deg., while the rectangular type gives a concentrated rectangular beam 10×40

**Fig. 3.—"Holophane" Floodlight Unit with Prismatic Lens.**

deg. In effect, a column or area of a length equal to four times the width can be illuminated with a single projector without undue spill of light.

### A New Small Generating Set.

AUSTINLITE, LTD., 614, Australia House, Strand, W.C.2, and the NEW PELAPONE ENGINE CO., LTD., 45, Baker Street, W.1, have jointly developed a useful compromise, fig. 4, between the full-battery plant and the batteryless type by using an automatic generating set with a small full-voltage battery of the motor-car starter type. The function of the battery is to provide storage for emergency and to deal with loads of up to about six lamps. When the load gets greater, or when the battery is discharged to a pre-determined limit, the engine is automatically started and the lamps fed direct from the dynamo; at the same time the battery is recharged. When the load falls to about six lamps and when the battery is fully charged the engine is shut down. The dynamo and control gear are a modification of the standard "Austinlite" automatic generator. Briefly, the controller consists of a voltage relay which comes into operation when the battery voltage falls to 1.9 V per cell. This is used in conjunction with a maximum demand relay. Either of these relays have the effect of energising a contactor which motors the dynamo from the battery and starts the engine. When the battery voltage is restored to 2.7 V per cell, and when the load falls to below a pre-determined limit, the relays reverse the operation and shut the engine down by the usual magneto earthing switch. The generator is provided with two commutators, the first providing 112 volts for direct lighting and the second 28 volts used in series with the 110-volt side for charging the battery. The control gear is incorporated in the dynamo frame. The engine is a standard "Pelapone" of the heavy-duty, four-cycle, water-cooled type, with magneto ignition and automatic continuous lubrication. A patent carburettor is fitted which prevents any possibility of flooding or fuel leakage, and has a very ingenious

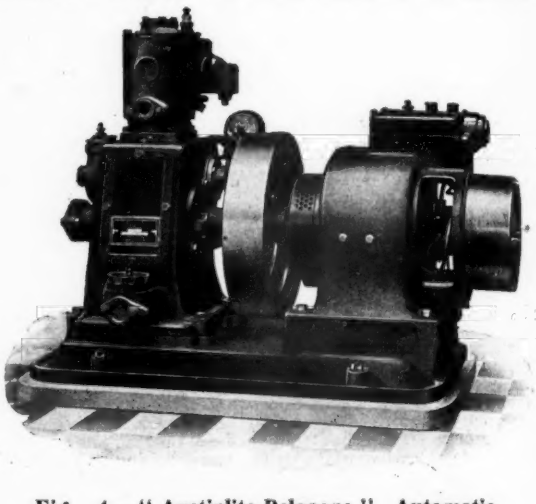


**Fig. 4.—"Austinlite-Pelapone" Automatic Generating Set.**

device to ensure easy and positive starting. There is also an ingenious device on the controller for limiting the period during which the dynamo may be motored from the battery. If the engine fails to start through a shortage of fuel, or for any other reason, the battery is disconnected—after motoring for a pre-determined time—in order to avoid any wastage of current. A re-starting device is provided which can be instantly reset after the cause of stoppage has been located.

# Legal.

### The Marconi Company's Royalties Appeal.

MR. JUSTICE LUXMOORE, in the Chancery Division, on April 24th, again had before him the appeal of Marconi's Wireless Telegraph Co., Ltd., from the decision of the Comptroller-General of Patents in favour of the application of the Brownie Wireless Co. of Great Britain, Ltd., that the royalty per valve holder in wireless receiving sets should be reduced from 12s. 6d. to 10 per cent. on the wholesale selling price of the set, subject to a minimum charge of 5s. on the first valve holder and 2s. 6d. on each additional valve holder. The appeal had been adjourned to enable the Comptroller-General to make a definite order. An appeal involving the Loewe Radio Co., Ltd., stood over for a similar reason.

Sir DUNCAN KERLY, K.C., for the Marconi Company, said the two appeals had some common elements, but they would have to be dealt with separately. Dealing with the Brownie case, he said the Comptroller had completed the order, and had settled the licence. If the decision was upheld it was of so far-reaching a character that it might be fairly said that the position of patentees and patent monopolies in this country would be radically altered. His Lordship's decision would be a final settlement of the principles involved unless the legislature interfered with fresh legislation. The matter concerned two patents, dated 1913, of the Marconi Company, which owned some 13 patents which controlled practically all valve receiving sets. After broadcasting began in 1922 the Marconi Company began to license manufacturers of apparatus under a settled policy, which was now fundamentally attacked. Licences had been granted to 2,200 manufacturers. It was said that if the royalties were reduced the home constructor would be no longer tempted to infringe the patents, but would buy the manufactured sets on which royalties were paid, and the Comptroller's decision was based on this. The Brownie Company had made crystal sets which were not affected by the patents. Lately the company put on the market a two-valve amplifier which, used with a crystal set, was outside the patents, but if used with a valve set might infringe. Mr. Barber applied to the Marconi Company for a licence, and was told he could have the usual licence. He refused, and applied to the Comptroller for a compulsory licence, alleging that the Marconi royalties were too high. Though not a single licensee had come forward to say that the licence was unreasonable and trade could not be carried on at a profit, the Comptroller had come to the conclusion that

the licence was unreasonable. His decision had altered the whole system of charging, and was based on erroneous propositions, one of which was that it was contrary to public policy to refuse to an applicant, who desired to make patented articles, a reasonable licence. The Marconi Company made the licensee pay 12s. 6d. on every valve holder, whether the apparatus was going to infringe the patents or not, and the Comptroller was apparently horrified at such a method of charging. He said: "No, you must only charge your royalty on articles which infringe the patent." If the Comptroller was going to be satisfied, and to find that the licence of the Marconi Company was unreasonable, it was essential that he should have before him the people who had been working under it, and must know whether they had been able to work under it with satisfaction or not. There was no evidence of that kind before the Comptroller. The hearing was adjourned, and upon its resumption, on April 25th, Sir DUNCAN KERLY, K.C., for the appellants, argued that the Comptroller-General had wholly rejected the business policy of the Marconi Company, and had forced on it an entirely new method. He had also forced an alteration of policy and trading on an enormous body of manufacturers and traders without having a single member of the trade before him, and without any examination of the existing system. The Marconi Company's policy was to insist on goods for this country being British made. It would be within its rights to grant licences to foreign manufacturers, and the evidence was that receiving sets in this country cost many times what they did in foreign countries. Suppose an English manufacturer was asked whether he considered 12s. 6d. too much to pay for protection from foreign competition. Could there be any doubt what the answer would be? The evidence was that the selling profit on existing sets was 50 per cent. of the retail price. The average price of a two-valve set was £5 4s. 6d., without valves. The royalty on two valves was £1 5s., and the distributors' profit was £2 12s. The Comptroller had found that there had been an abuse of monopoly rights by the Marconi Company, who were super monopolists. Counsel contended that there was no relevant evidence to support that conclusion, and that it was altogether contrary to law.

Mr. MORITZ, K.C., for the Brownie Company, said they disputed that the Marconi Company did not grant licences to foreign firms. Their case was that there were foreign corporations which the Marconi Company had licensed to bring apparatus into this country.

Evidence given at the inquiry before the Comptroller-General was read, and the hearing was again adjourned.

### British Thomson-Houston Co., Ltd., Litigation.

IN the Chancery Division, before Mr. Justice Romer, on April 23rd, Mr. Trevor Watson, on behalf of the British Thomson-Houston Co., Ltd., moved for an injunction against the Unity Manufacturing Co., Liverpool, to restrain the infringement of the plaintiffs' patent relating to gasfilled electric lamps. Counsel said that the defendants were willing to treat the motion as the trial of the action, and to submit to the usual order for an injunction and delivery-up of the infringing articles.

Mr. Watson also moved in two similar cases by the same plaintiffs against the Zenith Electrical Supplies Co., Liverpool, and the Harwol Specialities Co., Liverpool. In each case the defendants consented to a similar order.

Counsel for the Harwol Co. said that the costs of the inquiry as to damages would be reserved.

Mr. Justice ROMER said that in each of the three cases there would be a consent order.

### Fraudulent Consumption of Electricity.

T. W. BENETTO, of the "North Devon Radio Shop," was summoned recently at Ilfracombe by the Ilfracombe Electric Light & Power Co. for unlawfully abstracting electric current; he pleaded guilty. The company's solicitor stated that the meter inspector, on visiting defendant's premises, found that the apparatus had been tampered with, and energy evidently used without passing through the meter. Mr. Stewart, the manager of the company, was informed, and on visiting the premises found that electricity was being used in another room, defendant apparently requiring a fair amount for charging batteries. The meter was then properly sealed, but a few days later the seal was found to have been broken again. Defendant told the magistrates that he was "quite open" about the second occurrence. It happened on the Thursday previous to Good Friday, when he did not want to disappoint a customer, and, finding the meter going up very fast, he thought it was faulty, and reconnected it. He went to the company's offices that night, but they were shut, and he was away on the three succeeding days.

The magistrates imposed a fine of £3, and ordered defendant to pay the advocate's fee.

### Rating Appeal by the G.E.C.

THE General Electric Co., Ltd., appealed at the Coventry Quarter Sessions on April 26th against the assessment for rating purposes of its works at Stoke, Coventry, by the local assessment committee. The appeal was made on the grounds that the appellants were over-assessed, and that the assessment was unfair having regard to the assessments of comparable properties in the rating area. It was explained that the works were carried on for the manufacture of telephone apparatus, which entailed a considerable amount of female labour, and owing to the development of other industries it had become difficult to obtain the necessary amount of labour owing to the other industries being nearer the workers' homes, with the result that the company could not use the factory to its fullest extent, and had to re-open its Salford works. The company's ratable value was fixed in the draft list at £7,500, which was reduced upon objection to £6,000. The assessment of other works came out at 3.3d. per sq. ft. of covered area, and the appellants contended that 3d. per sq. ft. was a fair assessment for them in comparison with the other works which were much nearer the city. The company had spent £100,000 on a housing scheme for its employés, for which it could not get an economic return, and the result was a considerable expense.

For the respondents it was submitted that the arguments put forward could not be brought into account in arriving at the actual value of the hereditament.

After hearing the evidence of expert valuers on both sides the Recorder (Mr. J. F. EALES) dismissed the appeal, with costs.

# Correspondence.

***Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.***

### Proposed Technical Society for Meter Engineers.

With regard to Mr. H. F. Hudson's letter of April 19th, his criticism of the I.E.E. Meter Section's activities seems to me to be unjustified. During the past four months papers have been read and discussed before the Meter Section as follows:—

December 7th.—"Load-levelling Relays and their Application in Connection with Future Metering Problems," by W. Holmes, A.M.I.E.E.

January 4th.—"Precautions in the Use of Standard Instruments," by W. H. Lawes, B.Sc., A.M.I.E.E.

February 1st.—"Recent Developments in Electricity Meters, with Particular Reference to those for Special Purposes," by J. L. Carr, B.Sc., A.M.I.E.E.

March 1st.—"The Rotor Bearings of Electricity Meters," by W. Lawson, M.I.E.E.

Now Mr. H. F. Hudson's statement on "a review of the I.E.E. papers of the past four months" may be read as including all the I.E.E. papers, or only the Meter Section papers, but as he writes from a meter engineer's point of view, I assume he refers to the latter; in that case I am of the opinion that the above-mentioned papers are fully meeting the requirements of the majority of meter engineers. For instance, every meter engineer will appreciate the value of the paper on rotor bearings and how largely the correct functioning of an electricity meter depends on that small, but important, part. I may say that from this particular paper and the discussion on it I have obtained information that the careful examination of other meter literature has failed to reveal. Again, the paper by Mr. W. H. Lawes discusses precautions of primary importance to meter engineers. With regard to the difficulty of attending the meetings, this has been overcome to a certain extent, as in the case of Mr. J. L. Carr his paper was read at the Leeds, Liverpool, Manchester, Newcastle-on-Tyne, and London centres.

In discussing this matter with other meter engineers I find their opinions to be the same, namely, that the best interests of meter engineers are being served by the Meter Section of the I.E.E.

**S. Garbutt,**
*Graduate I.E.E.*

Altrincham, *April 23rd*, 1929.

### Registered Electrical Contractors.

The writer was extremely interested in reading the annual report of the above Registration Board. Its advertisement also is most interesting. What the public, however, would like to know is who, amongst them all, is capable of doing an installation without the supervision of a recognised electrical consulting engineer. It apparently puzzles the Executive of this Board why South Shields should ignore such an august body; the answer is probably that South Shields Electricity Department are not blinded, perhaps hoodwinked, by the twaddle emanating from the above body. In their long experience it is most probable that they have come across one or two reputable contractors who are outside of both the E.C.A. and the N.R.E.I.C., and that they are determined to assist firms whose conscience does not allow them to subscribe to rules and regulations, then

turn round and break them the following day, all for the sake of price-cutting. Personally, I have had the greatest pleasure in gutting jobs which originally were done by members of this Association—firms of long standing—and from the evidence gathered one can only conclude that they are trading on the good names made for them by first-class workmen employed before the war.

Instance 1.—A 415-V, 50-cycle, 3-phase, 200-h.p. motor earthed by 7/.036 insulated copper cable, and this in a factory. The firm was an old-established one.

Instance 2.—Heating plugs by the score with no switch controlling them.

Instance 3.—Four 7/.036 cables enclosed in ¾-in. s.w. tubing which it was impossible to withdraw after a period of three years.

The Corporation rules for this particular district are that not more than two 7/.036 cables may be inserted in one ¾-in. tube. Is it possible for any electrical firm which does first-class work to compete with such scandalous methods? Yet this body shouts from the house-tops, "Place your installation work, &c." I trust that the public, to safeguard themselves, will be educated to secure the services of a consultant. Then, and then only, will the contracting business be cleaned up.

**K. W. Cairney.**

Troon, *April 24th*, 1929.

[With the letter our correspondent sends a section of the conduit referred to in his "Instance 3." The four cables are jammed in so tightly that it is impossible to move them. It is evident that they were bunched and pulled in all together, which must have been a pretty difficult job. While agreeing that this is a horrible example, we cannot let our correspondent's views pass unchallenged. These views are, no doubt, a fair example of the opinions of many contractors who are not members of the E.C.A. or upon the Register. Both the Association and the Register, being human institutions, are bound to include some who do not act up to the ideals for which these institutions stand. Nevertheless, it must not be assumed from this that all associated or registered contractors are thoroughly untrustworthy, nor that all contractors outside the pale are paragons of virtue. There is no doubt that, generally speaking, the public is well-advised to give its work to registered contractors; in this there is at least some guarantee even if confidence is occasionally misplaced. We are convinced that the Executive of the Register is doing its best to maintain a high standard in installation work, and no doubt it will be grateful to receive fully-substantiated information of delinquencies on the part of individuals or firms whose names are on the Register. The disciplinary action which has been taken in a number of cases, and the set of "rules" which were put before the annual meeting of the Board, are evidence of its determination to keep the Register clean.—EDS. ELEC. REV.]

## The British Industries Fair.

The Advisory Committee for the Electrical Section of the British Industries Fair, at its meeting on Tuesday, the 23rd inst., had under consideration the important question as to what period of the year was most suitable for holding the Fair in future, having regard to all interests concerned.

The Committee had before it representations from various quarters that February was not a suitable date for the Fair. It was pointed out that when this question was under the consideration of the Committee last year a referendum of exhibitors was taken, the result being as follows:—

| | |
|---|---|
| The number of exhibitors to whom the questionnaire was sent was 122. | |
| Those who favoured the present period of the year, *i.e.*, February-March, numbered ... ... ... | 41 |
| Those who favoured the beginning of May numbered ... ... ... ... ... ... ... | 37 |
| Those who indicated that they were entirely neutral numbered ... ... ... ... ... ... | 5 |
| Those who put forward other dates as more acceptable numbered ... ... ... ... ... ... | 7 |
| Those who did not reply, and are apparently indifferent, numbered ... ... ... ... ... | 32 |
| Total ... ... ... ... ... ... | 122 |

In view of the inconclusive character of the referendum no further action was taken last year.

The main consideration would appear to be to determine what part of the year overseas buyers are in this country in largest numbers, and from information obtained from the shipping companies, it would appear that the months of May and June are most favoured. It was pointed out, however, that the views of the majority of exhibitors, actual and potential, in all the classes of industry affected should prevail. It was further pointed out that, having regard to the arrangements already made and the fact that 40 per cent. of the 1929 exhibitors have booked up their space for the 1930 Fair already, no change of date could be made so far as the 1930 Fair is concerned. After reviewing the matter from all angles it was resolved unanimously:

(*a*) That representations be made to the Fair Management Committee (Birmingham) that this Committee is of opinion that the month of May is a more suitable date for holding the Fair than February; that it has received representations from various quarters to this effect, and that it is of opinion that the Department of Overseas Trade and the Fair Management Committee (Birmingham) should hold an impartial inquiry to consider the important question of whether the present date is the most suitable one, more particularly from the point of view of attracting the maximum number of potential overseas buyers.

(*b*) That the Fair Management Committee (Birmingham) be invited to take a referendum of the whole of the exhibitors at the Birmingham section of the 1929 Fair to ascertain their views on this important question.

The Advisory Committee also decided to make representations to the Fair Management Committee on the following matters:—

(*a*) The more complete grouping of trades within the defined schedules.

(*b*) Improved facilities for reaching the Fair from Birmingham—a better 'bus service being required.

(*c*) Improved parking arrangements.

(*d*) The transfer of the Conference Hall to a more suitable position, in order to secure freedom from noise, &c.

The Committee was gratified to learn that E.D.A. intended to take a much bigger part in the Fair next year, and that a substantial sum of money had been voted for this purpose.

**E. J. Jennings,**

*Hon. Secretary*, ELECTRICAL SECTION.

Birmingham, *April 26th*, 1929.

## Telephone Development.

Why not suggest modified charges as a remedy? A £10 flat-rate service in 1911 now costs £30, in pennies!

Without inside information, I predict that cessations through commercial decay explain the smallness of the Manchester figure.

**L. E. Wilson.**

Manchester, *April 27th*, 1929.

Your editorial this week gives some rather startling figures, a conclusive argument against "Nationalisation," and after nearly 20 years we can still hear some people praising the old Telephone Company. Perhaps they are right, because, if there is a top dog to watch the public interest, it is quite a different matter from when that top dog runs the show himself, and has no one to call him to order.

I venture to suggest that the old National Telephone Co. would have made handsome profits in hiring out telephone instruments at 2s. 6d. per week, and then making an extra charge for touching them.

The whole system is so unbusinesslike, the accounts department delving into unnecessary details and worrying subscribers with them, the costly system of registering calls, &c. To bring this most useful luxury within the reach of the great majority of the middle classes, at least—and the working classes also have every right to be considered—some scheme should be possible whereby an agreement to pay a charge based on 10 per cent. of the assessment rate of the house, or business premises, would cover the cost of the instrument and fixing and unlimited calls. After all, this little island is really only local, and the word "trunk" redundant.

At present it is too expensive, as a luxury, and will not become a necessity until the majority of the nation can afford it, and it is the duty of a Government department to consider it in this light rather than to expend its ingenuity in devising methods whereby the largest number of staff can be employed at the expense of the subscriber.

**R. B. Askquith Ellis.**

Birmingham, *April 27th*, 1929.

## The Compulsory Earthing of Prepayment Meters.

The tremendous increase in the number of prepayment meters in use throughout the country has led to discussion in many quarters as to the advisability of efficiently earthing the cases of this type of meter in the interests of public safety.

This is a matter which has been brought up on quite a number of occasions in recent years, but it is still left for each supply authority to decide as to the procedure to adopt on its particular distribution system.

The frequent handling of the prepayment meter by the consumer for the purpose of inserting coins is of vital importance, and it seems to be remarkable that, while ordinary domestic apparatus has received so much attention latterly in the matter of efficient earthing of exposed metal parts, the question of earthing prepayment meter cases is only brought up on occasions.

There are, of course, a number of electricity undertakings in this country which do carry out the practice, and from information at hand I believe it is general practice in the United States; at any rate there must be thousands of prepayment meters already on circuit and being installed at present in this country without attention being given to earthing the cases.

The workmanship, quality of materials, and tests prior to

delivery of meters of British manufacture are usually of high standard, but it will be generally appreciated that the location of the meter on circuit has a great bearing on the condition of the insulating material after a period of service.

In my own Department, prepayment meters, as well as ordinary meters, are subjected to a " flash " test at 2,000 volts, alternating, between electrical circuits and case prior to installation, and, while this is an excellent test, there is still the problem of insulation depreciation in bad situations to be considered.

The danger to the consumer resultant from a bad insulation fault on an unearthed meter is obvious, and I think that the earthing of prepayment meter cases should be made compulsory.

It would be interesting to have the opinions of others on the matter, and I would also suggest that manufacturers should collaborate by supplying an earth terminal on the covers of all their prepayment meters.

**H. F. Hudson,**
*Graduate I.E.E.*

Electricity Works,
Hylton Road, Worcester,
*April 27th*, 1929.

# Published Specifications.

**Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.**

### 1927.

25,549. " Electric distant recording system and apparatus therefor, applicable for use in connection with various phenomena." S. J. Harley. September 28th, 1927. (Cognate application, 20,685/28.) (309,049.)

26,007. " Thermionic amplifier circuits." B. Bleasdale, P. V. Johnston, and W. E. Denison. October 3rd, 1927. (Cognate application, 1,447/28.) (309,052.)

26,346. " Electric heating." F. A. L. Billerey. October 5th, 1927. (309,093.)

32,254. " Regulating devices for prime movers." International General Electric Co., Inc. November 30th, 1926. (281,668.)

32,321. " Apparatus for use in the electrolytic deposition of metal on metal tubes." J. Stone & Co., Ltd., F. J. Pike, and C. J. Lyth. November 30th, 1927. (309,056.)

32,597. " Sound reproducing." S. K. Wilson and De Forest Phonofilms, Ltd. December 2nd, 1927. (309,208.)

32,640. " Junction box for electric cables." J. Birch & Sons and G. E. Taylor. December 3rd, 1927. (309,059.)

32,855. " Voltage-controlling means in systems for supplying electric consuming devices." Graham Amplion, Ltd., and P. K. Turner. December 5th 1927. (309,209.)

33,658. " Cooling systems of enclosed electric motors and other dynamo-electric machines." Enclosed Motor Co., Ltd., and P. A. H. Mossay. October 15th, 1928. (309,232.)

34,672. " Electromagnetic relays for use in telephone systems." C. H. V. Pate. December 23rd, 1927. (309,096.)

35,091. " Loud-speakers and the like." T. McClelland. December 28th, 1927. (309,214.)

35,129. " Electrical rectifying devices." Telefonaktiebolaget L. M. Ericsson. January 4th, 1927. (283,134.)

35,392. " Indicating devices, particularly for use in telephone systems." Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline, and C. H. Evans. December 30th, 1927. (308,960.)

35,455. " Apparatus for rectifying alternating electric currents." Westinghouse Brake & Saxby Signal Co., Ltd. May 5th, 1927. (289,866.)

35,456. " Remote-control arrangements for alternating-current circuits comprising metal-sheathed cables." Westinghouse Brake & Saxby Signal Co., Ltd. May 11th, 1927. (290,238.)

### 1928.

25. " Arrangement for controlling an operation depending upon whether a device is in motion or stationary." Associated Telephone & Telegraph Co. February 21st, 1927. (285,804.)

165. " Magnetostrictive vibrator." G. W. Pierce. January 3rd, 1928. (Convention date not granted.) (283,116.)

171. " Electric condensers." W. J. Davis. January 3rd, 1928. (309,015.)

188. " Radio receiving systems." British Thomson-Houston Co., Ltd. January 3rd, 1927. (283,121.)

189. " Bushings for use with electrical apparatus." British Thomson-Houston Co., Ltd., and J. G. Wellings. January 3rd, 1928. (309,109.)

230. " Secret electric signalling systems." Standard Telephones & Cables, Ltd. (Bell Telephone Laboratories, Inc.). January 3rd, 1928. (309,063.)

264. " Electric switchgear." A. Reyrolle & Co., Ltd., W. J. Cook, and D. Kingsbury. January 4th, 1928. (309,064.)

316. " Devices for damping vibrations in acoustic apparatus. Electric Research Products, Inc. May 14th, 1927. (290,558.)

317. " Electron-discharge devices with high-emission cathodes." Dr. S. Loewe. January 6th, 1927. (283,176.)

382. " Measuring or protecting apparatus for electric circuits." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz. January 7th, 1927. (283,215.)

479. " Ignition devices for internal-combustion engines." British Thomson-Houston Co., Ltd., L. Griffiths, and C. J. Morton. January 6th, 1928. (309,230.)

487. " Electric switches." General Electric Co., Ltd., H. W. B. Gardiner, and M. S. H. Hunt. January 6th, 1928. (309,221.)

495. " Electromagnetic devices for recording sound and reproducing sound from records." Electrical Research Products, Inc. May 13th, 1927. (290,264.)

496. " Electromagnetic devices for recording sound and reproducing sound from records." Electrical Research Products, Inc. July 14th, 1927. (Addition to 290,264.) (293,847.)

497. " Electromagnetic device for reproducing sound waves." Electrical Research Products, Inc. May 14th, 1927. (290,559.)

514. " Acoustic devices." S. K. D. M Van Lier. January 6th, 1928. (309,223.)

579. " Manufacture of photo-electric cells." General Electric Co., Ltd., and N. R. Campbell. January 7th, 1928 (Addition to 306,996.) (303,224.)

600. " Telephone systems." Associated Telephone & Telegraph Co. January 17th, 1927. (283,853.)

602. " Acoustic devices." H. J. Round. January 7th, 1928. (309,226.)

966. " Signalling systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). January 11th, 1928. (309,233.)

976. " Automatic switch devices for electric train-lighting and similar installations." J. Stone & Co., Ltd., and A. E. Honey. January 11th, 1928. (309,234.)

1,015. " Telephone systems." Associated Telephone & Telegraph Co. March 17th, 1927. (287,153.)

1,016. " Television systems." Electrical Research Products, Inc. April 6th, 1927. (288,234.)

1,305. " Electric lamp-locking device." H. Rhodes. January 14th, 1928. (309,240.)

1,392. " Electric discharge devices." A. A. J. Crowne. January 16th, 1928. (309,241.)

1,936. " Time-recording apparatus." Siemens & Halske Akt. Ges. March 24th, 1927. (Addition to 282,089.) (287,543.)

5,386. " Means for damping mechanical vibratory devices, such as piezo-electric crystals." Gramophone Co., Ltd., A. Whitaker, W. F. Tedham, and C. O. Browne. February 20th, 1928. (309,276.)

7,224. " Clip connections for electric conductors." L. H. Reid. March 8th, 1928. (309,284.)

7,888. " Radio apparatus." Igranic Electric Co., Ltd., and A. D. Hodgson. March 14th, 1928. (309,286.)

8,648. " Electric motor control systems." W. T. Gray, S. Griffiths, and Associated Electrical Industries, Ltd. March 21st, 1928. (309,290.)

9,115. " Circuit arrangement for the control of clocks over the lines of a telephone installation." Siemens & Halske Akt. Ges. May 31st, 1927. (291,371.)

9,276. " Dynamo-electric machines." M-L Magneto Syndicate, Ltd., and E. A. Watson. March 27th, 1928. (309,294.)

9,391. " Sound-reproducing or transmitting instruments." S. G. Brown, Ltd., and A. M. H. R. Brown. March 28th, 1928. (309,295.)

9,929. " Joints for electric cables." Pirelli-General Cable Works, Ltd., and R. E. Horley. April 2nd, 1928. (309,303.)

10,141. " Electric miners' lamps and the like." H. Leitner. April 4th 1928. (309,305.)

13,698. " Electromagnetic sound-recording devices." Electrical Research Products, Inc. May 13th, 1927. (Divided application on 290,264.) (290,290.)

14,270. " Means for equalising the electrostatic stresses in armoured cables." International General Electric Co., Inc. May 21st, 1927. (290,977.)

14,298. " Prepayment electricity meters." Soc. Genevoise d'Instruments de Physique. April 28th, 1928. (309,329.)

14,299. " Prepayment electricity meters." Soc. Genevoise d'Instruments de Physique. April 28th, 1928. (309,330.)

16,450. " Induction measuring instruments." Landis & Gyr Soc. Anon. May 16th, 1928. (309,338.)

17,727. " Arrangement of core segments in the casings of dynamo-electric machines, rotary transformers, and the like." Siemens-Schuckertwerke Akt. Ges. June 29th, 1927. (292,999.)

21,085. " Telephone systems." Associated Telephone & Telegraph Co. March 17th, 1927. (Divided application on 287,153.) (294,217.)

21,208. " Automatic circuit breakers for fire-alarm systems." Telefonaktiebolaget, L. M. Ericsson, and O. I. H. Ekman. July 21st, 1928. (309,358.)

33,618. " Chamber furnaces." International General Electric Co., Inc. November 19th, 1927. (300,905.)

34,724. " Electric heating elements." A. J. Rhodes. November 26th, 1928. (309,376.)

36,543. " Television and like systems." Electrical Research Products, Inc. April 6th, 1927 (Divided application on 288,234.) (302,239.)

### 1929.

810. " Ignition devices for internal-combustion engines." British Thomson-Houston Co., Ltd., and C. J. Morton. January 6th, 1928. (Divided application on 309,230.) (309,230.)

6,148. " Alternating-current induction motors." Dr. B. Schwarz. November 29th, 1926. (Divided application on 281,344.) (306,840.)

6,149. " Alternating-current commutator motors." Dr. B. Schwarz. November 29th, 1926. (Divided application on 281,344.) (306,841.)

# Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 24th :—

Glovers Cables. No. 497,090. Class 8. Electric cables.—W. T. Glover and Co., Ltd., Trafford Park, Manchester.

Lyfa (lettering and design). No. 500,263. Class 15. Glass shades and reflectors for use in electric lighting.—Aktieselskab Kjobenhavns Lampe og Lyseksone Fabriek, Copenhagen. (British representatives: Boult, Wade and Tennant, 112, Hatton Garden, E.C.1.).

Aladdin. No. 499,500. Class 16. Shades, containers and stands for electric lamps, all made of porcelain or earthenware.—Aladdin Industries, Ltd., 118, Southwark Street, S.E.1.

## The Embankment Lighting.

Owing to the fact that there would seem to be a wrong impression with regard to the retention of the historic Dolphin lighting standards on the Victoria Embankment, the General Electric Co., Ltd., announces that in the new scheme of illumination which is being carried out the Dolphin standards along the parapet are definitely to remain, and will still function as they have done since the Embankment was opened in 1870. The fact that workmen have been busily engaged in carrying out certain necessary reconstructional wiring details incidental to relamping these units is probably responsible for the wrong impression. There is also some slight misconception concerning the new system of twin overhead suspended lighting along the roadway, which is to be done at each span by means of two 1,500-watt lamps, housed in Wembley lanterns suspended 30 ft. over the roadway. In all there are to be 50 spans, spaced at intervals of 140 ft., each span carrying two lamps. The existing standards alongside the kerb-edge of the Embankment are being removed with a view to their ornamental bases being respaced and augmented to accommodate the new steel suspension poles, which will be mounted in such of the existing bases as are at present fixed along the Embankment, and which, bearing the small Dolphin design and the old coat of arms, will be retained to accommodate the new poles. As, however, there will not be enough of the old bases, new ones are being supplied of similar design, but embodying the new L.C.C. coat of arms in place of that on the old type.

# New Work for Contractors.

**Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.**

***Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.***

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ANDOVER.—School, for Hants. E.C.; director of education, Winchester.

BEXHILL.—Church for St. Peter's, Glassenbury Drive; J. B. Mendham.

BILLINGHAM.—Business stores, for Stockton-on-Tees Co-operative Society; secretary.

BRIGHTON.—Adaptation of Royal York Hotel for municipal offices; Corporation Improvements Committee.

BROMLEY (Kent).—Housing scheme (81), for the R.D.C.; building surveyor, Orpington (returnable deposit of £2 2s.).

BROMSGROVE.—Housing scheme (50) (deposit £2 2s.); R. Thompson, architect, Catshill.

BURNLEY.—School; director of education.

CANE HILL.—Telephone exchange; H.M. Office of Works.

CASTLE-DOUGLAS.—Housing scheme (32), for the T.C.; David Flett, architect, 22, King Street.

CHANDLER'S FORD (Hants.).—Congregational church (£3,500); Rev. D. Lloyd Jones.

CHARD.—Infirmary block, with nurses' quarters; Lymes and Madge, architects (returnable deposit £2 2s.).

CHATHAM.—Extensions, Glencoe Road schools, for the borough E.C.; R. L. Honey, architect, Town Hall (returnable deposit of £3 3s.).

CHELMSFORD.—Extensions, factory, Goldway Gardens; Mercury Press.

CHORLEY.—38 houses, Harrison Road; borough engineer.

CRAYFORD.—Two central schools, for Kent E.C.; W. H. Robinson, architect, Springfield, Maidstone (returnable deposit of £2 2s.).

CROYDON.—57 houses, Mount Park and Kingsdown Avenue; Morgan, Baines & Clark. Factory and offices, Stafford Road; Harper Automatic Machine Co., Ltd.

DERBY.—Municipal buildings; borough surveyor.

EASTLEIGH.—School, Fair Oak (£8,100), for Hants. E.C.; director of education, Winchester.

FELTHAM.—52 houses, Manor estate; Messrs. W. J. Drinkwater.

GLASGOW.—32 bungalows at Cathcart; McTaggart and Mickel, builders, 65, Bath Street.

GLENGALL (Ayr).—Re-erection of mental hospital, electrically equipped, for Ayrshire C.C.; clerk, Ayr (£20,000).

GRIMSBY.—Extensions to Scartho Hospital, for Corporation (£26,845); borough engineer.

HERNE BAY.—Development, Burton Downs estate, for Herne Bay Estates, Ltd.; R. Messenger.

HOUGHTON-LE-SPRING.—Theatre, with electrical and heating work; Percy L. Browne & Son, architects, Pearl Buildings, Newcastle-on-Tyne.

HOVE.—Refuse destructor (£9,771), for the T.C.; borough engineer.

IRISH FREE STATE (Cork).—Houses (30), Friar's Walk, for Irish Sailors' and Soldiers' Land Trust; W. J. Brown, architect, 7, Dawson Street.

(Dublin).—New wing, Catholic University School, Lower Leeson Street (deposit £3 3s.); Ashton & Coleman, architects.

KELSALL.—Elementary school (£12,300); Cheshire Education Committee.

KENDAL.—Laundry, for the Lakeland Laundries, Ltd., Hindpool Road, Barrow-in-Furness; W. G. Millican and A. Pickles, directors.

KETTERING.—Municipal offices and council chamber, for the U.D.C.; surveyor.

KINGSLEY.—Elementary school (£11,250); Cheshire Education Committee.

KIRK SANDALL (Doncaster).—Church, Congregational Trustees; T. H. Johnson, architect, Doncaster.

LANCASHIRE.—Railway colliery and canal bridges on Liverpool-East Lancs. new road; M. Dobell Mott, resident engineer.

LANGPORT.—Housing scheme (38), for the R.D.C.; W. H. C. Waters, architect, 40, Hendford Hill, Yeovil.

LONDON (Chingford, E.).—Telephone exchange, for H.M. Office of Works, King Charles Street, S.W. (returnable deposit of £1 1s.).

(Hackney, E.).—40 flats, Kenninghall Road; borough engineer.

(Ilford, E.).—Stores, flats and offices, Eastern Avenue; K. W. Hammond. Workshops, Metropolitan Cable Works, Grove Road; F. Smith. 32 houses, Eton Road; R. Nash.

(Poplar, E.).—Nurses' Home, St. Andrew's Hospital, Devons Road; Harley Heckford.

(Hornsey, N.).—New town hall; Special Committee.

(Bermondsey, S.E.).—Extensions, Guy's Hospital; Governors.

(Catford, S.E.).—Church, Downham housing estate (£10,000), for the Wesleyan trustees; Rev. W. H. Phipps, secretary.

(Eltham, S.E.).—72 houses, Avery Hill estate; J. E. Davies, Ltd.

(Lewisham, S.E.).—Factory, Silk Mills, Conington Road; P. A. Coad.

(Battersea, S.W.).—Extensions, Maternity Hospital (£3,736); borough engineer.

(Westminster, S.W.).—160 tenements, Ebury Bridge (£106,000); Gee, Walker & Slater, Ltd. Offices and shops, Bond Street; E. A. Stone. 35 flats, Vincent Street (£42,403); Humphreys, Ltd.

(St. Marylebone, W.).—Second section nurses' home, Middlesex Hospital, Ogle Street; Board of Governors. Buildings for B.B.C., Portland Place and Langham Street; Wal Myer & Watson Hart.

(Strand, W.C.).—Extensions, Savoy Hotel; Savoy Hotel, Ltd. Internal reconstruction, Savoy Theatre; Theatre Co.

MARGATE.—Pavilion, Cliftonville (£20,000), for the T.C., town clerk.

MIRFIELD.—Central warehouse, for the Co-operative Society; Hustler & Taylor, architects, Ropergate, Pontefract.

MORECAMBE.—Factory extension, White Lund; Souplex, Ltd. Extensions printing works, Union Street; A. Caunt.

OLDHAM.—Extension of outpatients' block (two wards), Royal Infirmary (£30,000); secretary.

PORTSLADE.—Factory, Victoria Road; Ronuk, Ltd. Factory, Victoria Road; Fry & Co.

PRESTON.—Church (£5,500), for the trustees of Guttridge Memorial United Methodist Church; Rev. J. Doidge, pastor

RHYL.—Extensions, County School, for Flints. E.C.; R. G. Whitley, county architect, Mold (returnable deposit of £2 2s.).

SALISBURY.—Re-erection of premises, The Canal, for F. Watson. Police station, for the T.C.; W. J. Goodwin, city engineer (returnable deposit of £2 2s.).

SHAW (Oldham).—Re-erection of Lyon Mill, for Taylor, Ltd., cotton spinners.

SKEGNESS.—Extensions, including operating theatre and X-ray department, at Skegness and District Cottage Hospital; W. F. Willis, architect, Agatha Road. Reinstatement of the municipal buildings, for U.D.C.; council surveyor.

SLOUGH.—Offices and warehouses, for Horlicks Malted Milk Co. Extensions, Upton Court, for Capt. A. Tickler.

STOCKTON-ON-TEES.—Boys' and girls' secondary school, for Durham E.C.; director of education, Durham.

STOURBRIDGE.—Employment exchange, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

SWINDON.—Extensions, Isolation Hospital, for the T.C.; borough surveyor.

TILBURY.—Housing scheme (257), for the U.D.C.; surveyor.

TYNEMOUTH.—Central municipal offices; Special Corporation Committee.

TRENTHAM (Staffs.).—Development, Mon-Abri estate, Stone Road; E. L. Maddock & Sons, architects.

WARRINGTON.—Additional housing scheme (260), Latchford, with electrical work, for the T.C.; borough surveyor.

WESTON.—Mental institution (£20,000); Warwickshire C.C.

WHITCHURCH.—Housing scheme (52), Talbot Street, surveyor to U.D.C.

WINSFORD.—Housing scheme (28), for the U.D.C.; Peter Heaton, surveyor (returnable deposit of £2 2s.).

WORSBOROUGH (Yorks.).—Additional 40 houses, for the U.D.C.; surveyor.